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80 micro

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SPECIAL ISSUE

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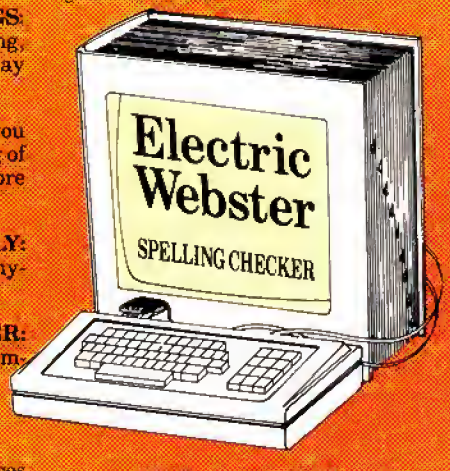

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The *80 Micro* Disk Series gathers together selected programs from this issue of *80 Micro* and puts them on a magnetic medium for your convenience. It is available on disk and runs on the Models I, III, and 4.

The *80 Micro* Disk Series programs are ready to run, and can save you hours of time typing in and debugging listings. The Disk Series also gives you access to assembly-language programs if you don't have an editor/assembler. And it helps you build a substantial software library.

Using the Disk Series is simple. If you own a Model I or III disk system, you boot The *80 Micro* Disk Series disk and transfer the files to a TRSDOS system disk according to simple on-screen directions. If you own a Model 4, copy the Model 4 programs from the Series disk to your TRSDOS 6.x disk using the Copy command.

Not all programs will run on your system. Some Model III programs, for instance, will run on the Model 4 in the Model III mode, but not in the Model 4 mode. You should check the system requirements box that accompanies the article to find out what system configuration individual programs require.

If you have any questions about the programs, call Keith Johnson at 603-924-9471. Yearly disk subscriptions to The *80 Micro* Disk Series are $149.95. Individual loaders are available on disk for $17.95, including postage. To place a subscription order, or to ask questions about your subscription, please call us toll free at 1-800-343-0728 between 9 a.m. and 5 p.m. Or, you can write to The *80 Micro* Disk Series, 80 Elm St., Peterborough, NH 03458.

Directory

Test Home-Brew Programs
Article: Data to Order (p. 69).
System: Model 4, 64K RAM.
Use Fakeout to generate dummy data for testing your home-brew programs.
Language: Basic.
Filespec: FAKEOUT/BAS.

Multipurpose Data Entry
Article: Communal Data Entry (p. 75).
System: Models III/4, 32K RAM.
Set up a data base with this common data-entry routine.
Language: Basic.
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Analyze Test Scores
Article: Test Tester (p. 78).
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Perform statistical analysis on test and other data.
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Disassemble Model I/III/4 Assembly Listings
Article: A Disassembler for All DOSes (p. 86).
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Disassemble any Model I/III/4 assembly listing written under nearly any DOS except CP/M.
Language: Assembly.
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The Next Step
Article: LS-DOS, MRAS, Odds, and Ends (p. 101).
System: Model 4, 128K RAM, LS-DOS 6.3, MRAS editor/assembler.
Understand the LS-DOS 6.3 security system, get more out of your MRAS, and other odds and ends.
Language: Assembly.
Filespecs: SERREAD/ASM, SERREAD/CMD.

Checksum
Article: How to Use *80 Micro* Program Listings (p.100).
System: Models I/III/4, 32K RAM.
Use our checksum program to check the accuracy of the Basic listings you type in.
Language: Basic.
Filespec: CHECKSUM/BAS.

SRC, ASM = source code, CMD = object code, BAS = Basic.
Editor/Asembler is optional when object code is provided, except where noted.
See page 37 for details on the quarterly disk series for the Tandy 1000/1200/3000.

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Circle 141 on Reader Service card.

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80 MICRO Review, November 1985

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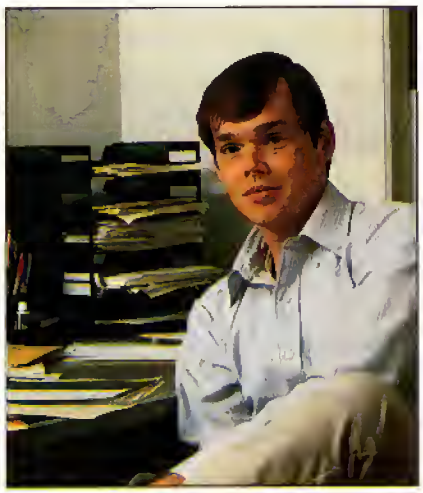
System requirements - IBM-PC Compatible. One disk drive, 128K memory, color or monochrome monitor, and DOS 2.0 or higher.
TRS-80 Model 1/3/4/4D/4P: One disk drive and 48K memory.

Ode to the Model I

"Computers are about to become a part of everyday life in American businesses, schools and homes," begins Radio Shack press release no. 7741-A, dated Aug. 3, 1977. "The company has just introduced its new Radio Shack TRS-80 Microcomputer System. Not a kit, the TRS-80 comes completely wired and tested, ready to plug in and use."

What was public-relations hyperbole 10 years ago now seems prophetic. While Tandy can't take credit for launching the computer industry, it can take pride in its role as the maker of the first mass-marketed, all-in-one microcomputer system.



Photograph by Frank Cordelle

An Original

Compared to today's high-powered 68020 and 80386 systems, the Model I looks a bit silly. The basic unit included a pokey 1.78MHz Z80 CPU, a 53-key keyboard, 4K of RAM expandable to 16K, and cassette storage. It came with Level I Basic, which had such features as two string variables (A$ and B$) and shorthand dialect (P for Print, REA for Read). Yet to come were such advanced statements as DIM, DEFINT, Else, Inkey$, LList, LPrint, Print Using, Peek, and Poke.

The Model I had all sorts of quirks and drawbacks, particularly if you went the whole nine yards and added an Expansion Interface and disk drives. If you could get past the spontaneous reboots, the keybounce would get you, and if not that then the bugs in TRSDOS 2.3. TRS-80 owners put up with outrages that today would drive a manufacturer out of business before it could say "upgrade."

Tandy was remarkably reserved about the potential of its Model I. Indeed, as Ron White reveals in this month's feature (see "The Tandy Story," p. 50), Tandy executives had little idea of what they were getting into. Only a few in the Towers saw where the Model I could lead.

"Keep in mind the TRS-80 isn't a panacea—it's a *small* computer," warned the introduction to its second microcomputer catalog. "Remember, too, that you'll need to write programs (our manual tells you how) or have them prepared to suit your specific needs."

But while the Model I lacked sophistication, its owners were blessed with an abundance of creativity and persistence. No one had any real expectations of what the computer should do, so users blissfully went about stretching the technology to (and sometimes beyond) its limits. New and better DOSes, doubled-sided drives, CP/M capability, new Basic commands, utilities, more RAM, higher resolution, and even color were some of the features that hackers granted the I and its successor, the Model III. While a few of these enhancements came from industrious third-party developers who eventually made a living selling their products, most were labors of love by individuals working in their basements and dens.

Survival and Success

I've written several times in this column about the excitement and camaraderie the TRS-80 community shared. I sometimes wonder whether Tandy fully appreciates the loyalty TRS-80 owners felt toward its machines and the Shack, or whether it completely understands how vital that loyalty was to Tandy's ultimate survival and success. A celebration of the TRS-80 is really a celebration of that loyalty, because without it Tandy would never have made it into the late 80s.

But on the other side of the fence, I don't know whether TRS-80 owners give Tandy enough credit for its role as manufacturer. Although company officials had doubts about whether a microcomputer could sell, they were ultimately willing to give it a try. When the time came to overhaul and refine the Models I and III, the company added many features that its customers demanded. The Model 4 offered a superior DOS, more memory, a better display, and a faster CPU, yet Tandy also provided an upgrade path by including a Model III mode.

Tandy users (including me) often mumble and complain about Tandy's seeming lack of concern for its established user base. I regularly get letters from TRSDOS users who, feeling abandoned, have discarded their TRS-80s for PCs, Amigas, and Macintoshes (I have yet to run across anyone who dumped his TRS-80 for an Apple, which I suppose is a moral victory of sorts). We sometimes forget that of all the microcomputers available in the late 70s, only two have survived: the Apple and the TRS-80. At a time when each year brings a new and superior technology to the market, this is a remarkable achievement.

Tandy could have easily and justifiably dumped the 4 several years ago without significantly affecting its bottom line. Yet even though the Model 4D is in its twilight, Tandy continues to sell and support the computer.

In the Long Run

If you're a new owner of a Tandy MS-DOS machine, you might wonder what importance the story of the TRS-80 has to you. Practically speaking, the answer is "none"—the history and fate of the TRS-80 have no relevance to your current computing needs.

But the longevity of the TRS-80 is a statement to you of what you can expect from Tandy when your own system becomes old and gray. Computer vendors will come and go, technologies will succeed one another like heavyweight titleholders, yet you can be confident that Tandy will be around to provide equipment and service. At this stage of the game, only IBM owners can boast a similar security.

I will confess to you new owners that this month's feature is an indulgence. Putting a picture of a Model I on the cover of a magazine in 1987 is a bit crazy. Call it one last tip of the hat to the machine, its users, and its maker. The microcomputer industry would not have been the same without them.■

Circle 91 on Reader Service card.

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Not Very Funny

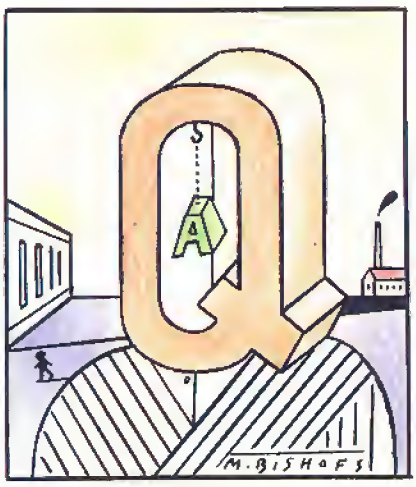
Q. I accidentally erased a data disk, which contained an inventory of comic books, by typing the Delete command. I lost months of data on that disk. Even though I made a printout of the data each month, I never made a practice of backing up the data disk, and I think I learned my lesson. However, I did try to recover the data by going into MS-DOS. I used Debug to try to undelete the data disk. I went into the directory and changed some numbers in the ASCII code section. I only partially succeeded. I did recover most of the data, but the data contained some garbage, some records were missing, and most of the records' fields were out of position. How can I recover the data? (Bruce Scandariato, Gretna, LA)

A. Due to the complexity of unerasing data files, a file-recovery utility such as the Norton Utilities or PC Tools should be an essential part of any software library. First, remember not to write to a disk on which you want to recover a file. The Delete command does not actually erase a file, but it alters the first character of the file name and the file-allocation table (FAT), thus making the disk space used by the file available for future writes. To recover the file, you have to restore the file directory entry (FDE) in the directory and the entire cluster chain in the FAT. This fairly complex process is explained by John B. Harrell III in "Disk Repair 101" in the March 1987 *80 Micro* (p. 42).

Customer Service

Q. I have seen references to mailings of updates and upgrades for the Color Computer and Model I. What do I do to get these mailings from Tandy? (Sharon Pulsipher, Henderson, NV)

A. Registered owners can write to Computer Customer Service, 400 Atrium, One Tandy Center, Fort Worth, TX 76102. If you are not a registered owner, you can request to become one. While I am on the subject of Tandy, the following phone numbers are for customer service: 817-338-239n, where "n" is 0 for spreadsheets and word processing, 1 for accounting, 2 for language and operating systems, 4 for hardware, 5 for Color Computer, laptops, and games, and 6 for education.



No Juice

Q. Last fall, I took advantage of a Radio Shack sale on the Digimouse controller and clock/calendar board. The battery expired six weeks ago. Local Radio Shacks have told me that the battery has been discontinued without replacement or cross-reference. Do you know how I can find a replacement battery? (Mike Parks, Camp Hill, PA)

A. You can order the battery (part no. ACS-0103) from Radio Shack National Parts Division, 900 East Northside Drive, Fort Worth, TX 76102, 817-870-5662.

Back to Normal

Q. I have a Model III with a DMP 200 printer. When I leave Superscripsit, the printer is left in the mode initiated by the Open Document options, proportional pitch in my case. This is annoying if I forget to switch the printer off and on again (the only method to reset it, as Tandy told me), and then print, let's say a disk directory, in proportional mode. As Superscripsit sets the printer to a specification at the start, there ought to be a way to make Superscripsit reset the printer to the selector switches on the printer. Do you know a patch to do this? (Henry H. Herrdegen, Windsor, Ontario)

A. The patches below are for Model III Superscripsit 1.3 and also work with version 1.3.1. This set of patches diverts the DOS exit to first reset the printer to data-processing mode prior to exit. You can change this to word-processing mode by changing the 13 hexadecimal (hex) value in the second line to 14 hex.

```
PATCH SCRIPSIT/CMD (ADD=647C,FIND=
  2D40,CHG=178A)
PATCH SCRIPSIT/CMD (ADD=8A17,FIND=
  00000000,CHG=3E13CD3B)
PATCH SCRIPSIT/CMD (ADD=8A1B,FIND=
  00000000,CHG=00C32D40)
```

For version 01.02:

```
PATCH SCRIPSIT/CMD (ADD=5735,FIND=
  2D40,CHG=267D)
PATCH SCRIPSIT/CMD (ADD=7D26,FIND=
  00000000,CHG=3E13CD3B)
PATCH SCRIPSIT/CMD (ADD=7D2A,FIND=
  00000000,CHG=00C32D40)
```

More Memory on Motherboard

Q. I own a Tandy 1200 HD. I want to increase memory size, and according to your answer to Adam Borin in "Piecemeal Memory" in the March Feedback Loop (p. 16), I can do it on the motherboard. I called my local Tandy Repair Center, and they said that the 1200 with seven slots *is* expandable on the motherboard and the 1200 with five slots *is not*. Are they correct? How do I expand my memory? Also, why does my screen freeze up when I use a memory-resident program, such as Sidekick? (John Cole, Fremont, CA)

A. The five-slot Tandy 1200 HD cannot be expanded on the motherboard, the seven-slot version can. You can verify this by examining the "Product Overview" page near the front of your *Tandy 1200, an Introduction and Guide* booklet. It will tell you if you can expand memory on the motherboard or not. Either way, the memory section of the options chapter outlines the method to expand the memory.

Your freeze-up problem might be due to an operating system/ROM conflict. The Tandy 1200s using MS-DOS 2.11.41 or later require that the version 3.0 ROM be installed on the motherboard. MS-DOS 2.11.41 comes with a small program called Version.COM that tells you the version number, or you can open the case and look in front of the card slots for the ROM, a large chip. The version is marked on top, usually on a white sticker. Another way to determine your ROM version is to enter Debug. Typing D F000:E000 displays the ROM copy-

Illustration by Maris Bishofs

Program Listing 1. Program to save a screen to disk and to print it again. See p. 100 for information on using checksums.

```
1 'MX-80 with GRAFTRAX Plus Screen Dump for Model 4
2 'M. Silver. Adapted from Model III prog. by Donald B. Heckenlively
3 'incorporate following command into your graphics program.
4 CLEAR,-3073                                                    '*  737
5 'Merge this program with your graphics program, and execute a
6 'screen dump by a GOSUB 65000
64999 'skip if already initialized
65000 IF XXXX THEN 65130 ELSE XXXX=1                             '*  2255
65010 'initialize graphics arrays
65020 DIM XX1(64),XX2(64),XX3(64),XX4(64)                        '*  2321
65030 FOR XX5=1 TO 16:READ XXX,XXY                               '*  2165
65040 XX1(XX5)=XXX:XX1(XX5+16)=XXX:XX1(XX5+32)=XXX:XX1(XX5+48)=XXX  '*  4342
65050 XX2(XX5)=XXY:XX2(XX5+16)=XXY:XX2(XX5+32)=XXY:XX2(XX5+48)=XXY  '*  4351
65060 NEXT XX5                                                   '*  869
65070 DATA 0,0,240,0,0,240,240,240,15,0,255,0,15,240,255,240     '*  2968
65080 DATA 0,15,240,15,0,255,240,255,15,15,255,15,15,255,255,255 '*  3209
65090 FOR XX5=17 TO 32:XX3(XX5)=192:NEXT XX5                     '*  2727
65100 FOR XX5=33 TO 48:XX4(XX5)=192:NEXT XX5                     '*  2725
65110 FOR XX5=49 TO 64:XX3(XX5)=192:XX4(XX5)=192:NEXT XX5        '*  3543
65120 'actual screen dump routine
65130 XX7=PEEK(120)AND 254:POKE 120,XX7:OUT &H84,XX7 'select screen  '*  3144
65140 LPRINT CHR$(18);CHR$(27)"U";CHR$(1)                        '*  2337
65150 FOR XX5=0 TO 1919 STEP 80:LPRINT CHR$(27)"A"CHR$(8);       '*  3405
65159 'read a video row byte
65160 FOR XX6=0 TO 79:XX7=PEEK(XX6+XX5+&HF800)                   '*  2832
65170 IF XX7<32 THEN XX7=32 'convert control codes to a space     '*  1618
65179 'put normal chars
65180 IF XX7<128 OR XX7>191 THEN LPRINT CHR$(XX7);:GOTO 65220    '*  3744
65189 'set up for display of graphics chars
65190 LPRINT CHR$(27)"K"CHR$(6);CHR$(0);                         '*  2280
65199 'do 1st half of line
65200 FOR XX8=1 TO 3:LPRINT CHR$(XX1(XX7-127));:NEXT XX8         '*  3505
65210 FOR XX8=1 TO 3:LPRINT CHR$(XX2(XX7-127));:NEXT XX8         '*  3507
65219 'set up for second half
65220 NEXT XX6:LPRINT:LPRINT CHR$(27)"A"CHR$(2);                 '*  2985
65229 'pick up row byte again
65230 FOR XX6=0 TO 79:XX7=PEEK(XX6+XX5+&HF800)                   '*  2830
65239 'ignore if not graphic
65240 IF XX7<128 OR XX7>191 THEN LPRINT" ";:GOTO 65280           '*  3246
65249 'else process second half of graphics
65250 LPRINT CHR$(27)"K"CHR$(6);CHR$(0);                         '*  2277
65260 FOR XX8=1 TO 3:LPRINT CHR$(XX3(XX7-127));:NEXT XX8         '*  3513
65270 FOR XX8=1 TO 3:LPRINT CHR$(XX4(XX7-127));:NEXT XX8         '*  3515
65279 'finish line:do next:done
65280 NEXT XX6:LPRINT:NEXT XX5:LPRINT CHR$(27)"@"                '*  3181
65289 'disable screen & exit
65290 XX7=PEEK(120)OR 1:POKE 120,XX7:OUT &H84,XX7:RETURN         '*  3533
```

End

Program Listing 2. Model 4 graphics screen-dump program for the Epson.

```
1 CLEAR,-3073:CLS
2 FOR J=1 to 8
6 FOR K=33 TO 200:PRINT CHR$(K);
7 NEXT K:NEXT J
12 OPEN "O",1,"GRAF"
20 POKE 120,PEEK(120) AND 254
30 FOR K=0 TO 1919
40 A=PEEK(K+&HF800)
50 PRINT#1, A;";";:NEXT K:CLOSE
100 POKE 120,PEEK(120) OR 1
110 CLS:OPEN "I",1,"GRAF"
125 IF EOF(1) THEN CLOSE:END
130 INPUT#1,A:PRINT CHR$(A);
140 GOTO 125
```

End

right and version. Before I had my ROM changed, my computer would freeze up when using several application programs, especially any with windows. The ROM change is about $35. If you are using the old ROM, be sure you have ANSI.DRV installed in Config.SYS.

Charts in Hand

Q. I am looking for a graphics screen-dump program for my Model 4 using an Epson printer. The graphics are stock charts constructed with "Upgraded Graphics" by Alan D. Smith in the August 1985 *80 Micro* (p. 76). I am also looking for a program to save the screen print of the charts. (A.M. Shackeroff, Houston, TX)

A. You basically need to peek at the Model 4 screen for the byte values for each of the 1,920 screen locations. In Basic, initialize your program with CLEAR, -3073 to protect the upper-memory screen area from Basic. Begin your Peek section with: POKE 120,PEEK(120) AND 254. End the section with: POKE 120, PEEK(120) OR 1.

Refer to "The Direct Approach" by Seth Monger in the September 1984 *80 Micro* (p. 96) for more information on this port configuration. Between these two statements use A = PEEK(X + &HF-800) where X is a value from zero to 1919 (screen location). The returned ASCII value of the location will be in variable A. Program Listing 1 is a brief program to save a screen to disk and to print it again. Program Listing 2 is a Model 4 graphics screen-dump program for the Epson.

Where Did All My Patches Go?

Q. Over several years, I have installed many patches on my Model 4D (using TRSDOS 6.2) to which I have become accustomed. I recently upgraded from Superscripsit to Scripsit Pro, and I am now using LS-DOS 6.3. Please give me the patches that will:

- eliminate the delta symbol in Scripsit Pro,
- reinstate the Kill command in LS-DOS 6.3, and
- eliminate password checking when manipulating files in LS-DOS 6.3.

I also need to find a printer driver to interface my Brother HR-15 to Scripsit Pro. Alps, which supplied my Superscripsit driver, is not supporting Scripsit Pro. (Robert W. Brown, New Albany, PA)

A. The patches to eliminate the delta symbol on Scripsit Pro 1.00.00 are:

PATCH SCR/CTL (D13,7D = 18:F13,7D = 20)
PATCH SCR/CTL (D15,C4 = 18:F15,C4 = 28)

Kill does not exist on LS-DOS 6.3, so you must replace Remove with Kill. The patch is:

PATCH SYS1/SYS.LSIDOS (D02,15 = 4B 49 4C 4C 20 20:F02,15 = 52 45 4D 4F 56 45)

You can disable password checking on LS-DOS 6.3 with this patch:

PATCH SYS2/SYS.LSIDOS (D02,50 = 18:F02, 50 = 28)

Warning! Some commercial software uses the password checking as part of its file control.

For those who have disabled the blinking cursor under Superscripsit and would like to do the same for Scripsit Pro, use the following patch:

PATCH SCR/CTL (D1E,AB = 28 FB 00 00 00 00:F1E,AB = 20 04 1B BA 20 F7)

A conversion program that changes Superscripsit printer drivers into Scripsit Pro printer drivers has just been developed by one of our industrious gnomes and is currently under testing. Stay tuned.

Scripsit Savvy

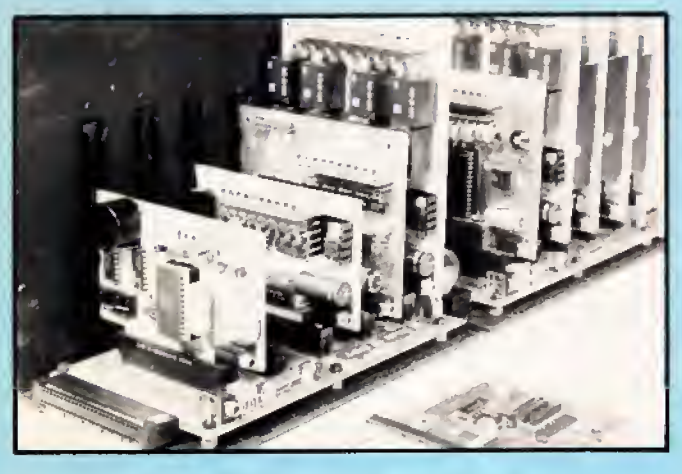
Q. I appreciated the question from Don Johnson (May 1987 Feedback Loop, p. 14) and your response about the files that make Superscripsit work. It gives me a better understanding of how the program works.

Your answer about System/CTL storing configuration formats makes me wonder if instead of having three or four disks set up, each with different user keys and margin settings (for different jobs), whether I could have several System/CTL files with different names and rename the one I want for the purpose at hand? Would you give the same information for Scripsit Pro as it has different files?

Will Electric Webster Spelling Checker, along with its correcting feature and grammar and style checker, work with Scripsit Pro, and if it will,

The Amazing A-BUS

NEW



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Digital Input Card — IN-141: $59

The eight inputs are optically isolated, so it's safe and easy to connect any "on/off" devices, such as switches, thermostats, alarm loops, etc. to your computer. To read the eight inputs, simply use BASIC INP (or PEEK).

24 Line TTL I/O — DG-148: $65

Connect 24 input or output signals (switches or any TTL device) to your computer. The card can be set for: input, latched output, strobed output, strobed input, and/or bidirectional strobed I/O. Uses the 8255A chip.

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A-BUS Prototyping Card — PR-152: $15

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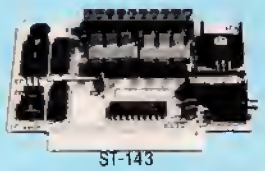
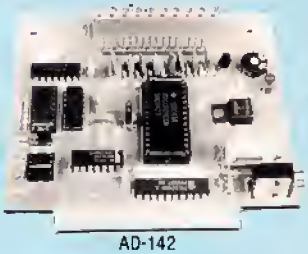


ST-143

CL-144

RE-140

IN-141



AD-142

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Power Driver Board Option — PD-123: $89
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TRS-80 Model 102, 200 Plugs into 40 pin "system bus".	AR-136...$69
Model 100. Uses 40 pin socket. (Socket is duplicated on adapter).	AR-135...$69
TRS-80 Mod 3,4,4 D. Fits 50 pin bus. (With hard disk, use Y-cable).	AR-132...$49
TRS-80 Model 4 P. Includes extra cable. (50 pin bus is recessed).	AR-137...$62
TRS-80 Model I. Plugs into 40 pin I/O bus on KB or E/I.	AR-131...$39
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what is the installation procedure?

Finally, can input for this column be transmitted to *80 Micro*'s BBS instead of by mail? (Ben Carpenter, Adrian, MI)

A. You can have several different System/CTL files on the same disk as long as they all have different names. Another possibility is to place the desired System/CTL file on the data disk and not on the Superscripsit disk. This way particular applications requiring one set of special keys and codes can be kept on the working disk for that application.

The Scripsit Pro format is more condensed than Superscripsit. Like Superscripsit, Scripsit Pro contains the Help and Error message files, as well as a healthy supply of printer drivers, a couple of sample text files, and a System/CTL file, which contains the user-defined keys and printer codes.

Scripsit/CMD is a short program that displays a copyright screen, turns off the cursor, and executes SCR/CTL, the actual main program. SCR/CTL is the heart of the system and contains most of the immediate editor routines such as the keyboard and display drivers and cursor movement control.

SCR0/CTL handles the spelling-checker interface. SCR1/CTL handles all aspects of blocked text control, tab-line editing, hyphenation, directory display, forms, file handling, windowing, user-key programming, printer-code editing, global find/replace/delete, and system setup.

If you notice a file called Move/CTL suddenly appearing on your disk, this is the disk-buffer file used during block copies and moves.

The publisher of Electric Webster, Cornucopia Software (P.O. Box 6111, Albany, CA 94706, 415-524-8098), will update your Superscripsit-compatible copy for operation with Scripsit Pro for $35.

You can submit questions via the *80 Micro* BBS, but you will not receive a mail reply (it's difficult for people to send a self-addressed, stamped envelope on the BBS). Also a personal reply on the BBS is not practical as that requires a long wait on our end for the BBS to be free. Otherwise, you would have to wait to see if it appears in the column—which is at least a three-month delay.

Mnemonics

Q. I would like to assemble Intel mnemonics on my Model 1. I seem to recall a company called Small Systems Software that produced the RSM series many years ago, and the first RSM-1 handled Intel Vice Zilog Mnenomics. If you can help it would be greatly appreciated—perhaps another assembler. (Bryan McPhee, Browns Mills, NJ)

A. If you have, or can get hold of, Radio Shack's (Microsoft's) Disk Editor/Assembler (catalog no. 26-2202), then you are in luck. It sold for $99 but is no longer a stock item. The currently available Model III and 4 versions of the Fortran package (catalog nos. 26-2200 and 26-2219, respectively) also contain the same macroassembler configured for those computers. You can use Intel 8080 mnemonics by using the -I switch during assembly. Most CP/M packages also feature an assembler that supports the 8080 mnemonics.

READERS RESPOND

Untended Code

In July's Feedback Loop, the routine given in my answer to Bob Keller's request for information about screen dumps for the Tandy 1000 ("Untended Screen Dumps") had the +1 and +2 reversed in line 30. The program should read:

```
10 SCPT$ = CHR$(205) + CHR$(5) +
   CHR$(203)
20 AD = VARPRT(SCPT$)
30 PR = PEEK(AD + 1) + PEEK(AD + 2)*256
40 CALL PR
50 RETURN
```

Sorry about that.—*Mercedes Silver*

Line Feed and More for 100

Paul Jaeger of Cary, NC, wrote in response to Noel Parks's need for a line feed from his Model 100. He sends the program in Listing 3. He can't promise that it will work with his Interactive Solutions ROM, but it is certainly worth a try. Credit for the program belongs to the New York City Lap Users Group, in particular George Mueden who tirelessly collects little goodies for the Model 100 and Model 4.

You can contact the New York City Lap Users Group via Sarah Stambler, 370 Central Park West, Apt. 210, New York, NY 10025. The group meets monthly, but time and place may vary (members are notified). Membership is $3 to cover the cost of mailings. Its Compuserve ID is 72236,3352. Sarah also referred me to Shoestring Publications (Box 712, Salem, MA 01970, 617-745-7027), which publishes a monthly magazine supporting the Model 100/200 family. Subscription costs only a note with your name, address, daytime phone number, and list of computer products you use. Shoestring also sponsors a large user group (over 2000 members).

Multiplan to Scripsit

Robert J. Aubrey of Massena, IA, takes issue with my answer to Ann Miller (March 1987) about transferring Multiplan spreadsheets to Scripsit and offers a better way. He says, "Saving the worksheet in symbolic format saves each cell on a separate line with the cell formatting information, etc. This makes it extremely difficult to work with. It also takes what seems an interminable length of time to save the file. (Loading was even worse—15 minutes for a 61- by 7-cell, mostly empty, file.) A much more practical approach is to print the worksheet to a file. This gives you an ASCII file to work with, and most word processors will have no problem handling it. The information will be properly spaced across the screen. It will probably still need some work, depending on your word processor, but not nearly what the symbolic file would require."

HELP WANTED

►Donal B. Marcus (926 West 15th St., Laurel, MS 39440) is looking for color ribbons to fit the Tandy DMP 130 printer.

►Ted Seidler (1194 Clinton St., Aurora, CO 80010-3111) is looking for the program APL*80 by Phelps Gates for the Model III.

►Peter Dutcher (P.O. Box 7, Culver, IN 46511) bought a Micro Illustrator for his Tandy 1000A. He intended to print the diagrams on a Color Graphics Printer 220. Tandy no longer makes the printer, and the Micro Illustrator does not give an option for another printer. He is looking for a way to change the program to work on a dot-matrix printer like a DMP 100.

►Herman A. Winters Jr. (110 Pheasant Lane, Willingboro, NJ 08046) is looking for Continental Software, in particular an updated version of its Model 4 Home Accountant program that will allow him to run it on LDOS.■

Program Listing 3. Line-feed program for the Model 100.

```
0 ' addlfc
1 KEY8,"Menu"+CHR$(13)+CHR$(254)+CHR$(13)+CHR$(245)+CHR$(62)+
 CHR$(10)+CHR$(204)+CHR$(63)+CHR$(109)+CHR$(241)
2 A=64228:I$=CHR$(27)+"p":N$=CHR$(27)+"q"
3 F$=" Off ":P=PEEK(A)+256*PEEK(A+1):IFP=63615 THEN F$=" On "
4 CLS:PRINT:PRINT"Line Feed "I$F$N$:PRINT:PRINT,"(E)nable",,
"(D)isable",,"(M)enu"
5 ON INSTR("eEdDmM",INPUT$(1)) GOTO 6,6,7,7,8,8:GOTO 5
6 POKE A,127:POKE A+1,248:GOTO 3
7 POKE A,243:POKE A+1,127:GOTO 3
8 MENU
```

End

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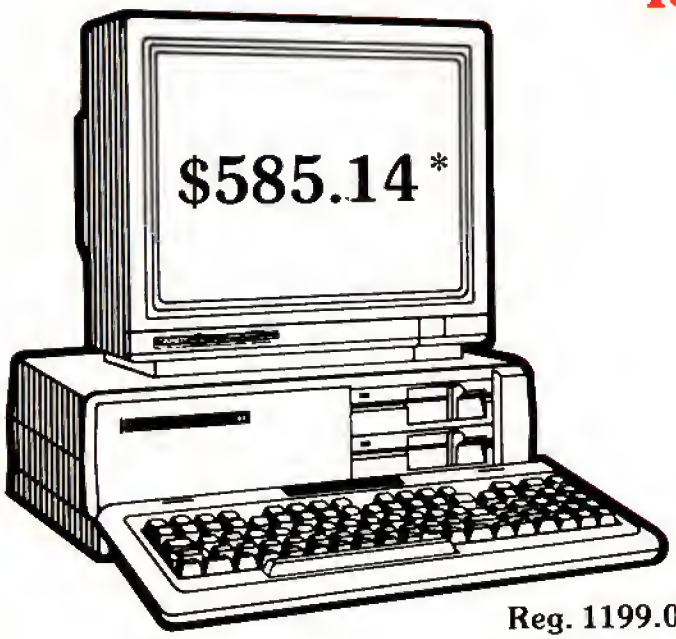

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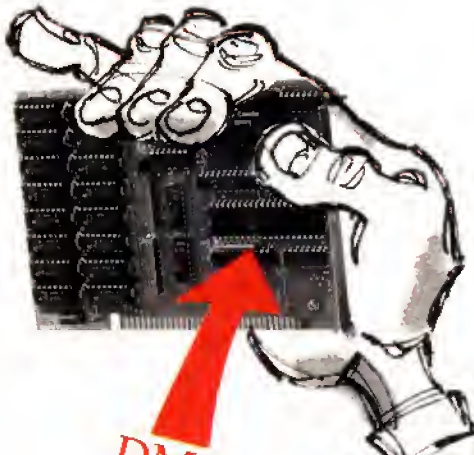

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The FCC Cracks Down

At this time last year, Tandy was getting ready to unleash its new Tandy 1000 SX and EX on the world when the Federal Communications Commission (FCC) stepped in the way. Tandy began taking orders before getting FCC approval stating that both machines met radio-frequency interference (RFI) standards. The company was forced to delay shipping while waiting for certification and lost money in the process.

The FCC's RFI enforcement efforts are more vigorous than ever, although Tandy appears to have escaped the agency's wrath for now. Not so for some of Fort Worth's competitors, including the dozens—perhaps hundreds—of small firms that make and sell MS-DOS-compatible computers. Many of these probably garage-based operations fail to get FCC approval before selling their products, sometimes out of ignorance of the rules; some might be using phony certification stickers; others might be lying to customers about their FCC status.

J.J. Freeman (see Photo 1), national coordinator of computer marketing enforcement at the FCC's Virginia Beach, VA, field office, said about half of the systems do not pass pre-certification tests conducted at an FCC lab in Columbia, MD. Post-grant tests performed on an ad hoc basis show a 75–80 percent failure rate.

According to a 1984 FCC bulletin, RFI guidelines were instituted in 1980 in response to reports of computer interference with television, telephone, airline, and emergency channels. Two classes of FCC approval were adopted. The radiation limits for Class B computers and peripherals are intended to protect a TV receiver that is at least 10 meters away and on the other side of a wall. Class A devices have less-stringent emission limits because they are used in businesses where interference is less likely than in a residential neighborhood.

Federal law states that all manufacturers of computers and peripherals must send an application to the FCC, with the results of radiation tests conducted by an approved firm, *before* offering the product to the public. Then they must send a complete system to the FCC for pre-grant testing. (Freeman called these machines "laboratory queens" and said they frequently bear "no resemblance" to the product being sold.) If the FCC finds that no part of the system emits radiation that could interfere with nearby devices, it issues a Grant of Equipment Authorization, and the company can sell the product. Sometimes, FCC investigators buy a random sample of computers on the open market for retesting or because they suspect a system no longer meets RFI standards.

Photo 1. J.J. Freeman directs the FCC's computer enforcement division.

How tough does the FCC get with violators? The Wholesale Outlet in Albany, NY, found out the hard way last year when U.S. marshals seized uncertified equipment from the floor of Comdex Fall in Las Vegas. Other companies have also had their products seized. Early in 1986, Freeman slapped an $8,000 fine on PC's Limited in Houston, and the company had to substitute another manufacturer's machine to fill orders. Subpoenas, search warrants, and threatening letters are also part of the FCC's arsenal. All told, the agency levied $230,000 in fines last year, and several are outstanding this year, Freeman said.

Tandy paid a $2,000 fine and lost revenue during the aforementioned proceedings, but the price paid in embarrassment is immeasurable. As Freeman tells it, the FCC had not approved the 1000s when Tandy began advertising the machines anyway. Tandy officials said they couldn't stop the marketing process because promotional material was prepared six months earlier. The FCC finally granted certification after Tandy agreed to put extra shielding in the printer cable.

In March 1987, Global Computers, a mail-order firm, was fined $4,000 for selling an uncertified PC through advertisements in *USA Today*. That same month, the FCC had a booth at the West Coast Computer Faire in San Francisco. Electronics engineer Daniel V. Bosque said FCC operatives recorded the numbers on certification labels for verification against a data base of approved computers. Several merchants selling products without stickers were told to display signs warning customers that the products could not legally be sold. "There are lots of questionable units," Bosque said.

As the FCC representative answered questions, the president of a small electronics firm, who remains anonymous, called the certification process "screwed up. . .the most violated regulation in the world." He ridiculed as "fiendishly complex" the pre-application testing process, especially the requirement to measure radio emissions in an open field. The expense of this favors large companies and penalizes small ones. "There are whole product lines we don't even go into because of it," he said.

Freeman wanted to clarify that consumers can be liable for owning and operating an uncertified computer. "They can be required to stop," he said, adding that his office can issue fines and subpoenas.

If you have a modem, you can check a computer's certification status by calling the FCC's Public Access Link at 301-725-1072, 24 hours a day, seven days a week. The system is menu-driven, has help functions, and is configured to run at 300 or 1,200 baud. There is a five-minute limit on calls made between 8 a.m. and 8 p.m.; after that, the limit is 15 minutes. The PAL computer identifies products by the number on their FCC certification stickers.

The FCC plans to go to Comdex Fall again this year, hoping to "educate" manufacturers and dealers in the proper

certification procedure. Don't be surprised if the agency uses old-fashioned teaching methods and makes an example of one or two violators. Freeman concedes the FCC is understaffed and can't keep track of every "Ma and Pa" company, but it means business nonetheless.

Independent consultants have established themselves as important players in the computer industry. They are often the most economical alternative for companies that can't afford to add full-time technical experts to maintain expensive computer systems. But consultants have a new worry, beyond finding work and keeping current with technology: They are desperately trying to defeat a tax law that could put thousands of them out of business.

The Tax Reform Act of 1986 contained a provision requiring independent consultants in certain technical categories to become employees of their brokers or of their clients.

The provision, known as Section 1706, effectively removed a "safe harbor" for technical consultants that was established in a 1978 tax bill. Sen. Daniel Patrick Moynihan (D-N.Y.) inserted Section 1706 after technical service firms complained—just as lawmakers were looking for ways to raise tax revenue—that their independent competitors were getting favorable treatment. *Computerworld* reported that Moynihan's action may have also been a quid pro quo for Republican concessions during the drafting of the tax act.

Under the new law, independent consultants must now answer the "20 Questions" that the Internal Revenue Service (IRS) uses to determine if a person should be treated as an employee of a company.

This could spell financial ruin for most consultants, as the companies that hire them are likely to shy away from the increased costs that accompany full employee status. And already, independent consultants report that brokers are hiring them at a much lower salary than before. Industry analysts note that the allocation of labor within the computer industry has become less flexible and thus less efficient.

Proponents of Section 1706, including the National Technical Services Association and ADAPSO, a software and service trade group, argue that the provision is aimed at closing a loophole for people who function like full-time employees while claiming to be independent contractors.

When independent consultants learned of Section 1706 last November, many were outraged, in part because the original law called for further study before any other changes were made. Congressional offices were inundated with calls, resulting in three bills that might provide relief for consultants who are already working under the new law, effective Jan. 1.

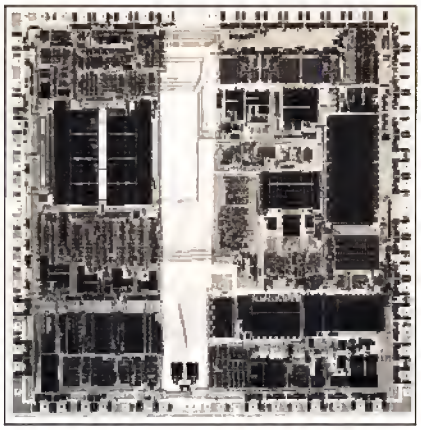

Photo 2. Zilog's new Z280 chip may eventually be used in a Model 4 board.

One bill introduced by Sen. Alphonse D'Amato (R-N.Y.) seeks outright repeal of Section 1706 until "Congress can study the entire independent contractor issue in a calm, deliberate, and dispassionate manner."

A second bill by Sen. Dave Durenburger (R-Minn.) would delay implementation for two years pending further study, and Rep. Judd Gregg (R-N.H.) has a similar bill before the House.

Much confusion and ill feeling surrounded Section 1706 as it took effect early this year. The confusion was over exactly who would be affected. In response to numerous inquiries, the IRS issued a Jan. 21 "clarification" stating that Section 1706 applies only to subcontractors working through brokers, not to independents who contract with clients directly.

But a regional branch of a national brokers association placed newspaper ads stating "clients of computer consultant brokers are not adversely affected in any way by Section 1706," and some large companies were delaying their hiring of individual contractors because of the uncertainty.

The ill feeling came when independents accused large technical firms and brokers of trying to scare off customers with biased interpretations of the law. According to *Computerworld*, ADAPSO issued a statement that called into question the safe-harbor status of independent workers. Meanwhile, an Ohio consultant threatened to sue large service firms that were telling clients that independent consultants had little chance of maintaining their status.

Jeff Sachs, president of the Independent Computer Consultants Association (ICCA), said his organization hired a Washington lawyer to lobby for repeal of Section 1706.

Sachs said he interprets the IRS clarification to mean that two-party relationships are unaffected by the new law, but he noted that the industry could be hurt as brokers pass on added costs. "The ones who are going to be the most affected are contract programmers who go through brokers," he said. The ICCA, which has a membership of 2,500 firms nationwide, devoted half of its May convention to Section 1706.

Should consultants expect any relief soon from Congress, which started the whole mess? Eventually, said several aides to congressmen with bills pending. Spokespersons for both D'Amato and Gregg said they were waiting for the introduction of a technical corrections bill to amend the Tax Reform Act of 1986. Their best guess on when the bill might be introduced: late fall at the earliest.

Tandyland

A multifunction speed-up board for the Model 4? In early May, it looked like a series of events would come together to provide Model 4 owners with something new to crow about.

High Tech Research in Redding, CA, announced the Z280 Ultraboard for the Kaypro 10 line of CP/M computers. The Ultraboard runs at 12 megahertz (MHz) and lets you address up to 16 megabytes (MB) of RAM.

It supports multiprocessing, multitasking, and networking, and it updates the screen 25 times faster than the computer's original board, according to High Tech Research. The Ultraboard is based on Zilog's new Z280 chip (see Photo 2), a recent upgrade of the Z80 chip used in early Kaypros and the Model 4.

Bill Nesting, president of High Tech Research, said plans to market an Ultraboard for the Model 4 beginning in August were "put on the back burner" after lengthy discussions about the technical challenges involved. "The main reason is that the interface to the Radio Shack is dramatically different," Nesting said, citing differences in the Model 4's operating system and ROM code, among other things. "I'm not saying we aren't going to do it, but we will not do it this year."

High Tech Research maintains a BBS that reports on the company's product development plans. You can call the Radio Shack section at 916-243-9358; UART settings are 9,600 baud maximum, 8-bit words, 1 stop bit, no parity. ■

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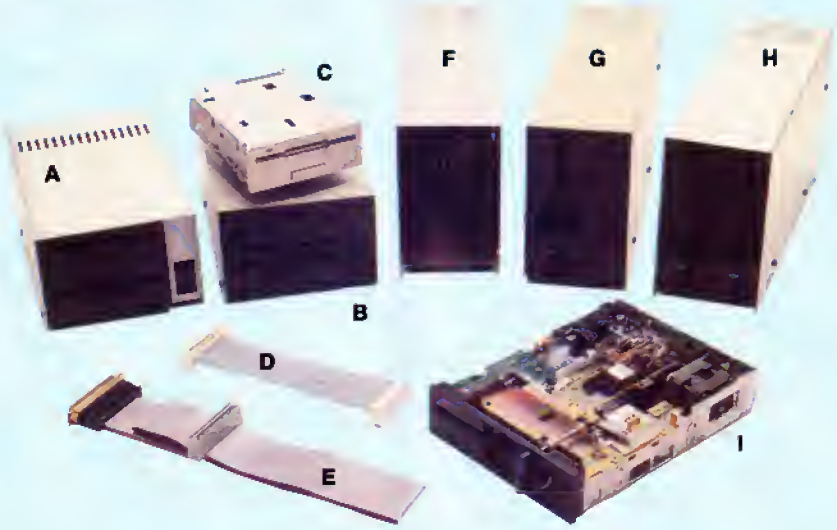

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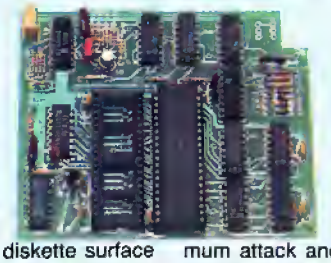

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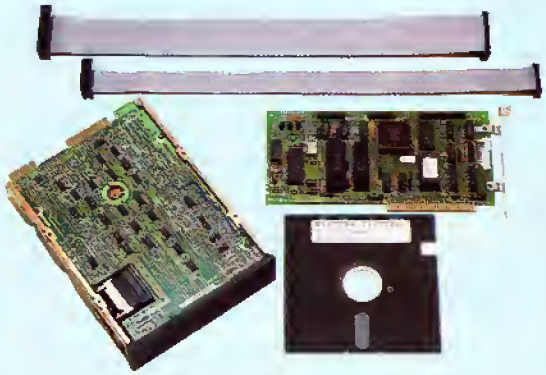

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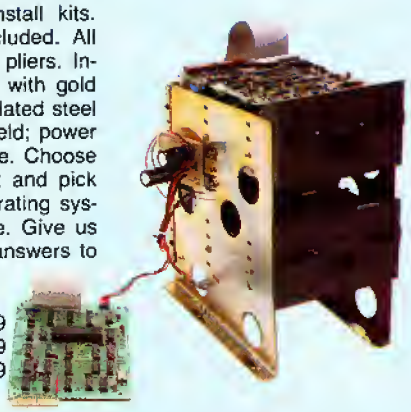

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More on Memdisk, Part III

Tom Trigg said in the April 1987 Reader Forum (More on Memdisk, Part II, p. 23) that he put Superscripsit (without Move/CTL) and two printer drivers on Memdisk with 13.5K to spare. Unfortunately, after building the JCL file and running it on my Model 4P, the screen flickered into the large-letter mode and wouldn't run Superscripsit. After turning the computer off several times in mid-project, I noticed that two files, Errors/CTL and System/CTL, had to be reset. I added the following to my original JCL file:

```
COPY ERRORS/CTL:0 :2
COPY SYSTEM/CTL:0 :2
```

Now Superscripsit loads right into Memdisk and runs like a charm. I put Move/CTL on my data disk just in case I need its help.

Al Perkins
Palm Coast, FL

First Things First

Start.BA automatically calls any program when you turn on your Model 100 or 102. It calls the Note.DO file and overrides the automatic feature that turns the computer off after 10 minutes of inactivity. If you don't want continuous power, eliminate lines 20 and 30 (see Program Listing 1).

To make the program work automatically when you turn on your computer, save the program as Start.BA, enter Basic, type IPL"START.BA", and press enter. Now if you enter Basic just before you turn off your computer, Start.BA will run the file you specify the next time you turn on your computer. To call any file at all, change the A$ assignment in line 10. The program adjusts automatically for the file-name length and value of the attribute byte.

Be aware that you can scramble your memory if you make a mistake typing in the program. Back up everything in your computer's memory before you initially run this program so you won't lose valuable files.

Jerry Engelbach
New York, NY

Program Listing 1. Start.BA.

```
10 A$="NOTE"
20 PRINT@130,"Warning: POWER CONT"
30 POWER CONT
40 FOR I=63844 TO 64140 STEP 11
50   F$=""
60   FOR J=1 TO LEN(A$)
70       F$=F$+CHR$(PEEK(I+J))
80   NEXT
90   IF F$=A$ THEN AT=PEEK(I-2):IF AT<>0 THEN
AD=I-2:I=64200
100 NEXT
110 IF AT=0 THEN PRINT@210,A$" not found":END
120 CLS:CALL 22848,AT,AD
```

End

What Day Is Tomorrow?

School-age children and trivia buffs might be interested in a retrospective calendar featuring the events of each day. Boot Personal Deskmate on the Tandy 1000 and move your marker to Calendar. Press the enter key (or double-click your mouse) to pull down the display menu, and select the Daily option. Type the information you want to save. Use the search option to find particular dates and record whatever messages you desire.

When you display a month, each date with a message is flagged with a marker in the upper-right corner of the date box. Pull down the File menu and save your "interesting tidbit" file under any name you choose. You can enter the data over several sessions or on an ongoing basis. You can retrieve this information simply by entering the file and paging through the dates. However, if you have a clock/calendar board or always enter the correct date when you boot, the Calendar file immediately displays the events of the past for that day.

Henry C. Gernhardt Jr.
Huntington, WV

Ending It All

Putting your documentation at the end of a program when you finish development has its drawbacks, but here is a method that intrigues me:

```
10 'program goes here.
1000 'program goes here.
50000 END
50010 GOTO 280,300 FOR:
   *** "KEYBOARD INPUT" ***
50020 GOTO 340,500 FOR:
   *** "DISK I/O"
   THIS ROUTINE WAS WRIT-
   TEN APRIL 1987
50030 GOTO 600,600 FOR:
   ***ROUNDING OFF DOL-
   LARS & CENTS ***
```

The advantage is that the Gotos describe the bounds of the routine. Since the documentation is at the end of the program, the Basic interpreter never encounters it at run time. It is automatically updated by renumbering the program. The renumbering facility treats it as though it is ON X GOTO 280,300. If you type GTOO and not GOTO, it won't properly renumber. This method helps you quickly find routines when you want to lift them to use in other programs.

If you want to know where your routines are during development, type LLIST 50000- and your documentation is neatly summarized on paper. If your program is too long to run with the documentation, simply delete the routines at run time.

Howard W. Mueller
Pocahontas, MO

Illustrations by Yvonne Buchanan

Squeezing 128K

You can use a 60K RAM disk on the Model 4P as a printer spooler. If you know your document does not exceed 25K (approximately eight pages), you can open it on drive 2 (Memdisk, bank 2) and still spool it on bank 1. Skip the prompts by typing SYSTEM (DATE = OFF) and pressing the enter key; then type SYSGEN and again press enter. Initialize Memdisk and the printer spooler, and go right to the Superscripsit menu using Program Listing 2. Press shift-control-@. At TRSDOS Ready type AUTO DO STARTUP/JCL.

When you next turn on or reset your machine, you can watch it all happen. If you break the print job, first turn the printer off to clear the printer buffer, quit the document and program, and at TRSDOS Ready, type SPOOL (C). Then press enter, type SCRIPSIT filespec, and press enter again to clear the spooler. Now restart the printer.

Having to clear the buffers on a misprint is the price you pay for freeing the computer with a buffer or spooler. The spooler still contains the document, but you cannot get multiple copies from it after you view the product without re-entering the document and commanding it on the Print Options menu. By typing SPOOL (N) and pressing enter at TRSDOS Ready, you turn the spooler off. Remember to copy your (logical) drive 2 document to (physical) drive zero or 1 before you reset or turn off the computer.

Bill Sullivan
San Clemente, CA

Program Listing 2. Startup/JCL.

```
BUILD STARTUP/JCL
SPOOL *PR (BANK=1,DISK=0)
SYSTEM (DRIVE=2,DRIVER="MEMDISK")
C
D
Y
SCRIPSIT

Press SHIFT-CTRL-@
At TRSDOS Ready type AUTO DO STARTUP/JCL
```

End

Teacher's Pet

To post grades after tests, I wrote a routine in Basic to give the day/date format (e.g., 03/23/87 is Tue 23, 1987) for any date from Jan. 1, 1983 (see Program Listing 3) without using a Peek. This routine works on the Model 4 and Tandy 1000.

Begin the dating from any leap year by adjusting the part of line 20 that reads DAY$ = MID$("XXX..."), where XXX is the day of the week beginning that year. To begin with 1980, change that section of line 20 to DAY$ = MID$ ("TueWedThuFriSat SunMon", DA,3).

I expanded the above subroutine into a program to print out calendars of any given month following January, 1984 (see Program Listing 4). With changes in DY$ of line 70, you can begin with any leap year. This program is for the Model 4; for the Model 1000, change all Print@ statements to Locate statements. For example, line 20 should read LOCATE 1,1:PRINT" ";: INPUT "MO/YEAR?", DTE$. Change LPOS(50)>52 in line 290 to LPOS(0)>52.

I also wrote the following function to return a letter grade given a number grade:

```
DEF FNGRADE$(X)= MID$
  ("FDCBA",-(X>-1)-(X>
  59)-(X>69)-(X>79)-
  (X>89),1)
```

Then type PRINT FNGRADE$(75), where 75 is a sample grade. A grade of "C" appears on the following line.

Keith Alford
Port Gibson, MS

Program Listing 3. Basic routine to give a day/date format. See p. 100 for information on using checksums in Listings 3 and 4.

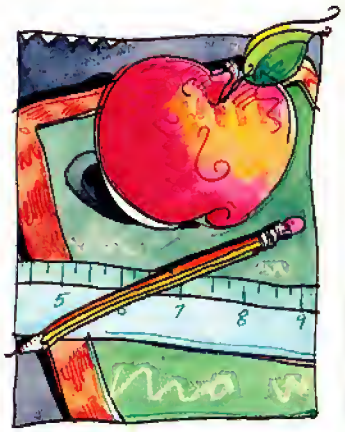
```
10 CLS                                                          '*  355
20 PRINT@(1,1),"";: INPUT "MO/YEAR ?",DTE$                      '*  2479
30 K=VAL(LEFT$(DTE$,2)): IF (K<1 OR K>12) THEN SOUND 7,1: GOTO 2
   0                                                            '*  3806
40 K=LEN(DTE$): IF (K<>7) THEN SOUND 7,1: GOTO 20               '*  2900
50 Y0=VAL(RIGHT$(DTE$,4)): Y1=Y0-1984: Y= Y1 MOD 4: MO=VAL(LEFT$
   (DTE$,2))*3-2                                                '*  4496
60 DNO$="000031059090120151181212243273304334365": Y1=(Y1)+(Y1\4
   )+(Y=0)                                                      '*  3736
70 DY$="SunMonTueWedThuFriSat": DA=VAL(MID$(DNO$,MO,3))-(Y=0 AND
    MO>6)+1+Y1: DA=(DA MOD 7)+1                                 '*  6105
80 MON$=MID$("JanFebMarAprMayJunJulAugSepOctNovDec",MO,3)       '*  4639
90 CLS:PRINT@(5,34),MON$+" ,"+STR$(Y0): FOR I=0 TO 6           '*  3026
100 PRINT @(7,22+5*I), MID$(DY$,(I*3+1),3)                      '*  2243
110 NEXT I: L2=8: L=22                                          '*  1262
120 DA1=VAL(MID$("031028031030031030031031030031030031",MO,3))-(
   Y=0 AND MO=4)                                                '*  4074
130 FOR I=1 TO DA1                                              '*  1035
140 L=5*(DA-2+I): L1=(L MOD 35)+22                              '*  1806
150 PRINT@(L2,L1), USING "###";I;                               '*  1861
160 IF (L1=52) THEN L2=L2+1                                     '*  1500
170 NEXT I                                                      '*  608
180 PRINT @(L2+3,20), "DO YOU WANT A HARD COPY <YES> OR <NO> ";:
    INPUT A$                                                    '*  4419
190 ON INSTR("   YESNO ",A$)\3+1 GOTO 200,210,10                 '*  2685
200 SOUND 7,0: GOTO 180                                         '*  1338
210 LPRINT TAB(30) MON$+" ,"+STR$(Y0)                           '*  2114
220 LPRINT: LPRINT SPC(17);                                     '*  1722
230 FOR I=0 TO 6                                                '*  907
240 LPRINT SPC(2); MID$(DY$,(I*3+1),3);                         '*  2204
250 NEXT I                                                      '*  607
260 LPRINT: LPRINT SPC(17+5*(DA-1));                            '*  2172
270 FOR I=1 TO DA1                                              '*  1040
280 LPRINT SPC(2); USING "###";I;                               '*  1929
290 IF LPOS(50)>52 THEN LPRINT: LPRINT SPC(17);                 '*  2936
300 NEXT I: LPRINT                                              '*  1166
```

End

Program Listing 4. Calendar generator.

```
10 Y0=(1900+VAL(RIGHT$(DATE$,2))): Y1=Y0-1984: Y= Y1 MOD 4: MO=V
   AL(LEFT$(DATE$,2))*3-2                                       '*  4946
15 DNO$="000031059090120151181212243273304334": Y1=(Y1)+(Y1\4)+(
   Y=0)                                                         '*  3578
20 DA=VAL(MID$(DNO$,MO,3))-(Y=0 AND MO>6)+VAL(MID$(DATE$,4,2))+Y
   1:DA=((DA MOD 7)*3+1): DAY$=MID$("SunMonTueWedThuFriSat",DA,3
   )                                                            '*  8020
25 MON$=MID$("JanFebMarAprMayJunJulAugSepOctNovDec",MO,3):DD$=DA
   Y$+" "+MON$+""+STR$(VAL(MID$(DATE$,4,2)))+", "+"19"+RIGHT$(DA
   TE$,2)                                                       '*  6660
```

End



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Searching High and Low

As you can see, our renovations are complete, and look at all the room we have this month! Now, you can unfold your Basic routines and spread them over several lines, if that's what a program needs. We also have room to discuss—or debate—solutions to the common (and not so common) programming problems presented here each month. If you're up for a difference of opinion, you'll find me a willing participant.

Making the change complete is the new set of rules you'll find at the end of the column. We've dispensed with the idea of winners, since no one was happy with the way it implied losers. You're invited to take on our monthly challenges for the fun of it, for the exercise, and for the discoveries they often lead to.

To keep up with *80 Micro*'s production schedule and maintain some semblance of order, I still need your solutions to specific programming problems by the 15th of the issue month. Also, I'm especially looking for your comments, criticisms, suggestions, and the program stoppers you've encountered, whether you've solved them or not, to keep the action in this space lively. Send those along anytime. If I use anything you send me, even a Bronx cheer, I'll see you get one of our coveted *80 Micro* T-shirts for your trouble. Since you can't beat that, join in.

In Search Of

Three month's ago I broached the subject of searching text files. I confess, I was somewhat casual in my approach to the problem. Sure, I knew it was different from searching the ordered lists you find in data bases, but I didn't fully realize how many factors were involved in the kinds of text searches typically found in word processors and editors until I tried to go beyond the Simple Simon solution of Program Listing 1.

Maybe that's why I got lots of nice mail this month, but no two-line solutions. I received pleas for help, a nifty approach with bells and whistles in 22 lines, and a challenge from Ray Belanger (Everett, MA) that amounted to, "You do it in two lines, wise guy."

Back to the Drawing Board

The objective is to find all occurrences of a search term (i.e., some text string) in an ASCII text file. Great. So what's an ASCII text file, exactly? A definition helps.

While the sources for text files are many, there is a more or less standard definition of them: They contain text characters (ASCII codes in the range 32 through 127), carriage returns (code 13), an end-of-file character (code 26), and nothing else. Word processors, data bases, spreadsheets, and other productivity software usually produce "delimited" ASCII files in addition to files in their native formats; most program code, including Basic code saved with the A option, is in ASCII; electronic mail and other in-

Program Listing 1. Simple Simon search for all Basics.

```
10 IF S THEN IF NOT EOF(1) THEN LINE INPUT#1,T$:P=INSTR(T$,S$):IF P THEN MI
D$(T$,P)=STRING$(S,42):PRINT T$:PRINT:GOTO 10 ELSE 10 ELSE ELSE CLS:INPUT"F
ile to search";F$:INPUT"Search term";S$:S=LEN(S$):PRINT:OPEN"I",1,F$:GOTO 1
0
```

End

Program Listing 2a. Two-line search for TRS-80 Basics.

```
10 CLS:INPUT"File";F$:INPUT"Find";I$:GOSUB 20:S$=T$:S=LEN(S$):OPEN"R",1,F$:
FIELD 1,128 AS T$(0),128 AS T$(1):FOR R=1 TO LOF(1):GET 1,R:FOR L=0 TO 1:I$
=T$(L):GOSUB 20:N=1:P=INSTR(T$,S$):IF P THEN PRINT LEFT$(I$,P-1)+"<"+MID$(I
$,P,S)+">"+RIGHT$(I$,65-P-S)
20 IF N THEN N=0:C=C-(P>0):NEXT L:NEXT R:CLOSE 1:PRINT:PRINT C;"found." ELS
E T$="":FOR I=1 TO LEN(I$):A$=MID$(I$,I,1):A=ASC(A$):T$=T$+CHR$(A-32*(INSTR
(" ABCDEFGHIJKLMNOPQRSTUVWXYZ",A$)>1)):NEXT I:RETURN
```

End

Program Listing 2b. The same two-line search for GW-Basic.

```
10 CLS:INPUT"File";F$:INPUT"Find";I$:GOSUB 20:S$=T$:S=LEN(S$):OPEN"R",1,F$:
FIELD 1,64 AS T$(0),64 AS T$(1):FOR R=1 TO LOF(1)/128:GET 1,R:FOR L=0 TO 1:
I$=T$(L):GOSUB 20:N=1:P=INSTR(T$,S$):IF P THEN PRINT LEFT$(I$,P-1)+"<"+MID$
(I$,P,S)+">"+RIGHT$(I$,65-P-S)
20 IF N THEN N=0:C=C-(P>0):NEXT L:NEXT R:CLOSE 1:PRINT:PRINT C;"found." ELS
E T$="":FOR I=1 TO LEN(I$):A$=MID$(I$,I,1):A=ASC(A$):T$=T$+CHR$(A-32*(INSTR
(" ABCDEFGHIJKLMNOPQRSTUVWXYZ",A$)>1)):NEXT I:RETURN
```

End

Illustration by Hal Mayforth

Program Listing 3. A not-quite-complete text search.

```
5 ' For TRS-80s, modify lines 20 and 30. Refer to Listing 2a.
10 CLS:INPUT"File";F$:INPUT"Find";I$:GOSUB 200:S$=T$:S=LEN(S$):PRINT
20 OPEN"R",1,F$:FIELD 1,64 AS T$(0),64 AS T$(1)
30 FOR R=1 TO LOF(1)/128:GET 1,R
40 FOR L=0 TO 1:I$=T$(L):GOSUB 200:M=1:D$=""
50    P=INSTR(M,T$,S$):IF P=0 THEN 80
60      D$=D$+MID$(I$,M,P-M)+"<"+MID$(I$,P,S)+">":M=P+S:C=C+1
70      IF M<LEN(T$) THEN 50
80    D$=D$+RIGHT$(I$,(LEN(I$)+1)-M)
90    IF M>1 THEN PRINT D$:PRINT
100 NEXT L:NEXT R:CLOSE 1:PRINT C;"found.":END
200 T$="":FOR I=1 TO LEN(I$)
210       A$=MID$(I$,I,1):A=ASC(A$)
220       T$=T$+CHR$(A-32*(INSTR(" ABCDEFGHIJKLMNOPQRSTUVWXYZ",A$)>1))
230 NEXT I:RETURN
```

End

formation received by modem more often than not is unadorned ASCII.

Given the nature of ASCII files, Line Input is a valid device for reading them. Line Input accepts all text characters, including the commas and quotes that would confound an ordinary Input statement. It stops at each carriage return or the end of the file, or, lacking either of those, it takes up to 255 characters at a time. Line Input lets you examine the entire file without missing anything you might be looking for.

Likewise, the INSTR function makes sense. It's accurate, easy to use, and quick. Any kind of character-by-character search in Basic would be deathly slow, and unnecessary. Listing 1 makes use of Line Input and INSTR—and not much else. It prints any string in which it finds the search term. It even points out the position of the search term—by obliterating it, which is a little drastic. That's all it does.

For anyone who's interested, the twisted logic of the single line shows how Basic interprets multiple If. . .Then. . . Else statements as nested structures. It makes the "Else Else" necessary. You won't see it demonstrated quite so starkly except in a packed line, but it's an important idea to remember.

A Better Way

Program Listings 2a and 2b at least manage to preserve the search term and highlight it by putting brackets of a sort around it. The brackets are generic. There are as many ways of actually highlighting text as there are models of Radio Shack computers, but you can't highlight at all on the Model 1.

These two programs take a different approach to the text file by treating it as a random (or direct) access file. That way you get the text in conveniently equal chunks, which Line Input cannot guarantee. You'll see the search term, in context, with enough additional information to be meaningful. And the predictable length of the strings will be easier to use in a formatted video display. On the down side, unless you look for the end-of-file character, which neither of the programs do, you pass it.

The two programs add another feature to the search: The subroutine in line 20 eliminates case sensitivity. Your search term and the text can have any combination of upper- and lowercase letters. The routines will match them anyway.

Despite trying to keep everything generic, by using the brackets instead of highlighting and avoiding things like While. . .Wend that early TRS-80 Basics don't have, I still needed two versions of Program Listing 2 to cover all Basics—to coin a phrase. The differences between the two programs are important to any of you who made the move from TRS-80 to Tandy, or are thinking about doing it soon.

While TRS-80 Basics always used a standard record size of 256 bytes, GW-Basic defaults to a smaller 128-byte record. More important, the LOF function of TRS-80 Basics returns the number of records in a file, while GW-Basic's LOF gives you the size of the file in bytes. You then have to divide by the record size to get the number of records.

Wanted: Improvements

But none of the routines so far finds *every* occurrence of the search term. Even though both versions of Listing 2 count the number they do find, they look no further than the first successful match in each section of text. They overlook much.

Program Listing 3 spreads the routine over several lines and makes it much easier to read and follow. In the process, the little loop from line 70 to line 50 makes sure the program looks at the whole chunk of text before going on and counts everything it finds. But it still won't find everything.

Before we can add bells and whistles to this text search, we'd better solve a small problem: What about those times when what we're looking for isn't entirely present in the section of text we're looking at? What if it's split, part in one chunk of text and part in the next? Nothing I've done so far covers that case.

Start with Listing 3, if you like, or start over. Either way, find every occurrence of the search term regardless of the arbitrary divisions of the text file caused by the way you read it. And while you're at it, use the method of highlighting the search term in context that suits your version of Basic.

Numbers, Numbers, Numbers

For extra credit, here's something off the wall. Recently I read about a word processor that offers as a feature the ability to change all the numbers in a document to words—that is, 5 to five, 62 to sixty-two, and so forth. At first I thought, "How quaint," but it's not as inconsequential as it seems. Whether to use numbers or the words for them is a question of style. *80 Micro*, for instance, and other technically oriented magazines tend to favor numbers. Journals with a literary bent, such as the *New York Review of Books*, lean toward words.

Changing numbers to words isn't a particularly difficult programming problem, but it's tricky, especially handling the teens. How far can you go with it? How many numbers can you find words for? (For the really adventurous, what does it take to reverse the process and turn words into numbers?) Start with this line:

```
100 INPUT"A number";N$:GOSUB 1000:
    PRINT W$:PRINT:GOTO 100.
```

What you put around it is up to you, but use my line 100 to preserve my already questionable sanity.

The Rules:

1. Write your programs or routines in any TRS or Tandy Basic, except Pocket Computer Basic.
2. Solutions to this month's poser(s) must reach us by August 15, 1987, to be considered for the November 1987 issue.
3. Employees of CW Communications already have T-shirts and are not eligible.
4. Send your solutions, comments, criticisms, suggestions, and T-shirt size to: *80 Micro*, Fine Lines, 80 Elm St., Peterborough, NH 03458. We cannot return any material.■

Harry Bee is a free-lance writer, puzzle creator, programmer, and dreamer. You can contact him at P.O. Box 567, Cornish, ME 04020, or on Compuserve (74076, 3461).

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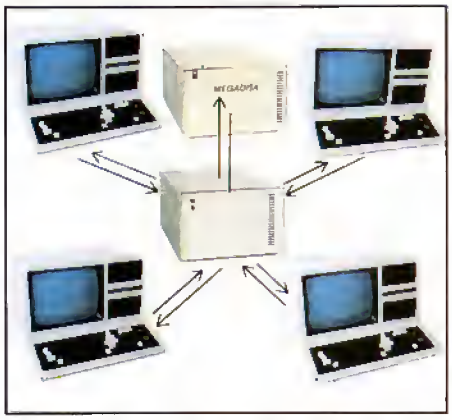

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The Tandy 1000 SX

by Dave Rowell

The Tandy 1000 SX comes with 384K, two disk drives, five expansion slots, and MS-DOS 3.2 and GW-Basic 3.2. Tandy Corp., Fort Worth, TX 76102, Catalog no. 25-1051, $999, $849 with one drive.

Photo 1. The Tandy 1000 SX is powerful and expandable.

The 1000 SX is Tandy Corp.'s latest version of its inexpensive but capable PC compatible. The SX is faster, more expandable, and more compatible than earlier 1000s, and the price stays just under $1000. Table 1 shows a list of specifications for the machine for easy comparison.

The improvements are not readily apparent from the outside; the SX has the same white plastic case as older models—sturdy, lightweight, and attractive (see Photo 1). The panels covering the two drive bays, however, are now white instead of black. The SX doesn't hog space, partly because of its shorter-than-IBM-PC expansion slots.

A recessed area along the bottom front shelters the orange reset button (easy to press, but out of harm's way), two joystick ports, and the keyboard plug-in. The latter is handy, yet low enough so that the keyboard, when raised on its legs, can butt flush to the SX on a shallow desk without hitting the cable connector.

Through long use I have grown to like the 1000 keyboard; it's easy and dependable, but a little loose-keyed. This keyboard is the same one Tandy introduced several years ago with its less compatible 2000. The key layout is fairly close to that of the enhanced keyboard now offered with IBM micros—12 function keys across the top and a separate cursor cluster—but it's somewhat cramped and not totally compatible.

The non-standard number and placement of keys causes minor compatibility problems with a some software packages, especially in the keypad area. Usually, you can stumble across some key combination that triggers the function you wish to use.

On Borland products, for instance, pressing alternate-break substitutes for the missing scroll-lock key. Tandy provides a keyboard driver (KEYCNVRT.SYS) that seems to help with some programs. The print key can also get you. Hit it accidentally with no printer ready to go and you might have to reboot.

CPU: 8088-2
RAM: 384K
Clock speeds: 4.77/7.16MHz
Power supply: 67W
Expansion: Five 10-inch slots
Keyboard: 90-key Tandy design
Display: built-in CGA controller, monitor optional
Drives: one 360K floppy
Software: MS-DOS 3.2, GW-Basic 3.2, Deskmate II
Ports: parallel printer port, two joystick ports, light-pen port, speaker jack
Math coprocessor socket: yes
FCC rating: B
Dimensions: 16 inches wide, 13½ inches deep, 6 inches high
Weight: 11 lbs.
Price: $849 with one floppy drive, $999 with two drives

Table 1. Specifications for the Tandy 1000 SX.

Physical Evidence

The SX runs somewhat faster than older 1000s (and IBM PCs), but you won't see physical evidence of improvements until you look around back (see Photo 3). There you'll find openings for five expansion slots (up from three), and, on early SXes, a grounding connection for the printer cable—a last-minute change to meet FCC requirements for radio-frequency interference (RFI). This connection is now built into the cable.

The grounded printer cable (optional) is still a non-standard card-edge connector rather than the 25-pin D connector found on IBM PCs, and the new 1000 still provides a light-pen port.

Open the SX—still just two easy-to-reach screws on the case front—and you find most changes are inside (see Photo 2). Not only are there more expansion slots (albeit a short 10 inches long), but you need fewer slots to upgrade the SX. It comes with a DMA (direct memory access) controller and 384K right on the motherboard with empty sockets to go to 640K. With built-in printer and CGA-

video circuitry, you may have trouble finding enough boards to fill five slots. Tandy souped up the power supply accordingly, but to a less-than-powerful 67 watts (from 54 watts).

Tandy has addressed most major 1000 compatibility problems, too-short slots and keyboard layout aside. The SX accepts display adapters, thanks to a DIP switch that disables its built-in video circuits. Other DIP switches free some of the SX's hardware-interrupt lines for add-on boards. This means you can flick a switch and plug in a standard PC-compatible hard-drive controller that uses hardware interrupt 5.

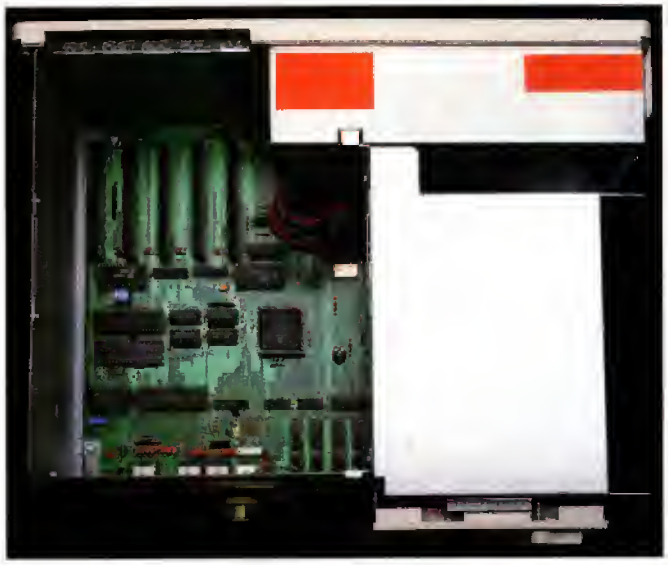

Photo 2. It's easy to open the SX and install additional boards.

The basic input/output system (BIOS) ROM (version 1.02) fixes other snags. For instance, the SX now checks for the presence of an 8087 math coprocessor chip and sets the appropriate bit in low memory during bootup.

In spite of metal RFI shielding on all sides, the SX is open inside; you can still easily reach all DIP switches, jumper settings, empty RAM sockets, and the 8087 socket. There's also a metal bar across the top of the expansion area that you must slide off before adding or removing expansion cards. All the electronics are on the motherboard, leaving room not only for the five slots, but also for a piggyback hard drive like Tandy's 20-megabyte (MB) Hard Disk Card.

Putting in new boards is still a bear, because of the cheap little screws that hold and ground the boards onto the SX's metal back. The almost slotless screws defy most screwdrivers. Once you've managed to unscrew one, you're likely to drop it onto the motherboard, because the upper lip of the plastic facade on the back makes the screws hard to get to. At least the black hole by the fan opening is gone. A screw dropped there meant removing the plastic back.

The last major hardware improvement is the 50 percent increase in clock rate. The SX runs default at 7.16 megahertz (MHz), but you can slow it down to the standard 4.77MHz with DOS's Mode command if you're having speed problems with an expansion card or a game program. Unfortunately, the 50 percent clock speedup only translates to a 25 percent performance increase with most practical speed benchmark tests. Norton Utilities' Sysinfo shows a 40 percent increase, but a spreadsheet recalc with Lotus's 1-2-3 Release 2 only speeds up 18 percent. Several little Basic tests I wrote (a graphics program and a simple For. . .Next loop) both run only 25 percent faster in the SX's fast mode.

Sound and Color

Although the 1000 SX mimics the IBM in most hardware details important for compatibility, it's not a clone. It has two of the enhancements that came with the PCjr: three-voice sound and two extra color video modes. In addition to pure tones, the special sound chip can also generate several types of noise. Several programs take advantage of these features (the King's Quest series, for one), but otherwise you'll have to write your own programs with the 1000's version of GW-Basic.

One disadvantage of the 1000's jr-like video capabilities is that the video circuitry takes up 16K of user RAM to store the display image rather than use RAM chips specific for video circuitry. If you use one of the special jr video modes (e.g., the 16-color, 640- by 200-pixel mode), you lose 32K of RAM to video storage.

I found the SX speaker too loud for many programs; play a game on this computer and the whole building knows it. There is a trim pot (variable resistor) on the main board that you can adjust with a small screwdriver to lower the volume.

You have several display options for the SX. The built-in circuitry supports RGB monitors in CGA mode and drives both color and monochrome composite displays, too. A composite monochrome monitor, such as the VM-4, provides sharp text but doesn't translate colors well to shades of gray. Tandy's CM-11 RGB monitor displays good sharp 640- by 400-pixel color graphics and adequately clear text. The cheaper CM-5, however, is good only for 320- by 400-pixel graphics and terrible for text display.

Unlike earlier 1000s, the SX can use video expansion cards once you've switched off its internal video circuitry. Tandy offers several video boards that will fit in the 1000's 10-inch slots. The dual-display graphics adapter can drive a CGA-compatible monitor like the CM-11 or a TTL monochrome monitor like the VM-3 that produces high-resolution text or Hercules-type graphics.

Another adapter card can drive the high-quality color and monochrome displays made for the 2000. Tandy's EGA card is too long for the 1000, but Tandy provides a third-party EGA board through its Express Order Hardware program.

Photo 3. The SX offers five expansion slots where older 1000s had three.

Drive Storage

Tandy first introduced the SX as a two-floppy computer (now selling for $999). The TEAC 55B floppies that come with the SX are loud, especially at bootup. Recently, Tandy brought out a one-drive SX ($849, catalog no. 25-1052) to give you more drive storage options. To fill that empty bay,

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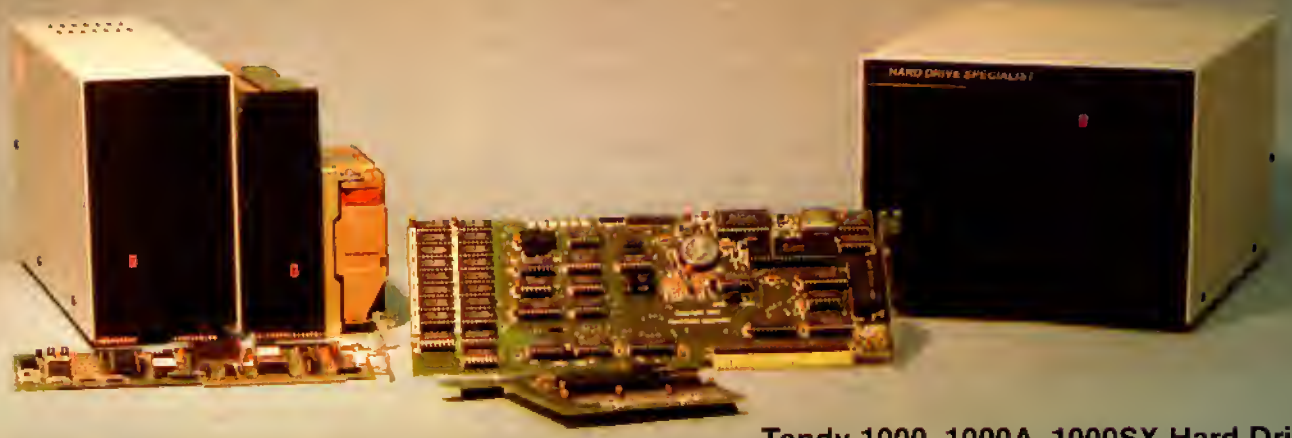

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Tandy provides 5¼-inch 360K floppy and 3½-inch 720K floppy drives. You can also put any half-height hard drive in that bay. Unfortunately, the 20MB internal Bernoulli system Tandy markets doesn't go in the 1000.

You can still upgrade the two-floppy SX with Tandy's 20MB internal Hard Disk Card ($799, catalog no. 25-1029), because this drive doesn't require one of the drive bays. It's a standard hard-drive unit bracketed to a short controller card. You must plug the card into the rightmost slot so the drive can stick into the empty space between the slot area and the two drive bays. I had some trouble performing a high-level format on the drive. It kept failing on one particular track until I ran it through a low-level format. From then on, it has worked reliably and quietly. I've been using the 20MB hard card for many months.

The 20MB drive's performance is mediocre. Core's hard-drive test gives it a random average time of 90 milliseconds (ms)—what you'd expect for an IBM XT-type hard drive. The Doran test, which uses Norton Utilities' Disktest program (version 3.10) with the /D parameter to test sequential disk access, gives Tandy's hard card a slow 22K per second. The XT's standard hard drives usually can test 44K per second.

Software Included

Tandy gives you MS-DOS 3.2 and GW-Basic 3.2 with the 1000 SX. The Basic is specific for the 1000 and supports the three-voice sound chip and PCjr graphics modes. In other respects, the 1000's Basic is compatible with other GW-Basics and IBM's BasicA. You don't get a full-fledged reference manual for either DOS or Basic (optional from Tandy for $29.95). A quick-reference booklet gives you much of that information in condensed form for all DOS commands and Basic statements, though.

The Play sound statement in the SX's GW-Basic chokes on long strings of notes when playing in background mode, but Tandy has an optional patch for it. Copy Patch.COM from the MS-DOS Supplemental Program disk to a backup copy of the DOS disk. At the DOS prompt, add the following lines to your Basic backup disk:

```
PATCH BASIC.EXE,6E0F,
  75F1,9090
PATCH BASIC.EXE,7ED5,
  26C7,EB05
```

If you make these changes, make a note of it in the version log; however, the version number remains the same.

The 1000 SX MS-DOS is a standard version of 3.2, although the Mode command has some options specific to the SX. Fast and Slow parameters switch the SX between 4.77 and 7.16MHz clock speeds, for instance. Graphics.COM has also been modified to support many of Tandy's non-IBM-compatible printers.

If you're used to MS-DOS 2.x, you'll find some new DOS capabilities and commands, like Xcopy. Xcopy can copy whole subdirectories without having to create the destination subdirectory first. I like the ability to run a program from some distant subdirectory by specifying the path name. Both the DOS and Basic are slightly larger than previous versions.

If you are new to MS-DOS computers, a big plus to buying the SX is Tandy's Deskmate II integrated all-purpose program. This memory-resident program comes with the machine and offers a full complement of capabilities: text editor, spreadsheet, filer, scheduling calendar, calculator, alarm, and phone directory. If you have a modem hooked to your 1000 SX, you can use Deskmate II's telecommunications program (with host mode), mail system, and phone dialer. Because it's memory-resident, you can jump between Deskmate and some other program, if you have enough memory.

Getting Started

Deskmate is a good package to get you started. It has all the common applications that people use on micros. Each has the most basic functions that type of program should have, and not much more. You can get a feel for what a spreadsheet does or get onto Compuserve with a modem. If you have a serious need for any of these capabilities, however, you'll want to graduate to full-featured software.

The 300-page owner's manual has three parts. The first section covers the equipment: setup, the components and what they do, care of disks, and adding options. Detailed drawings help you locate the various parts, such as the socket for a math coprocessor chip. The second part covers the basics of using MS-DOS to do essential functions such as prepare disks and copy programs. The major part of the spiral-bound manual explains how to use Deskmate II. Compact size, good printing, and thoughtful layout ease the learning process.

How Compatible?

The 1000 SX is not an exact copy of the IBM PC, but it does mimic the essential hardware. This, along with the Phoenix BIOS, makes the SX greater than 95 percent PC compatible. Tandy has eliminated many of the compatibility problems of earlier 1000s. The ability to use video expansion boards or an unmodified hard-drive controller are prime examples. Also, as the 1000 has gained in popularity, software manufacturers have learned how to avoid unsavory programming practices that trip up the 1000's few remaining hardware quirks.

Two design kinks remain to keep the SX from reaching 99-percent compatibility. First, the 10-inch expansion slots limit your choice of add-on boards, although you can find a variety of short cards to do almost anything these days. Second, the non-standard keyboard layout can frustrate users of several important software packages—Microsoft Word and Framework, for example. Tandy now advertises a Universal Keyboard Adapter that lets you use a standard IBM PC/AT keyboard on your SX—an expensive solution. See Table 2 for a list of Tandy's options for the SX.

Monitors:
- CM-5 320-by-200 RGB monitor ($300)
- CM-11 640-by-200 RGB monitor ($460)
- VM-4 composite monochrome monitor ($130)
- Dual display adapter for RGB and TTL monochrome ($250)
- Deluxe display adapter for Tandy hi-res VM-1 color monitor ($400)

Drives:
- 20MB hard card ($799)
- 720K 3½-inch internal floppy ($199.95)
- 360K 5¼-inch internal floppy ($169.95)

I/O:
- Dual serial port ($99)
- Digimouse/clock board ($100)

Modems: 1200 baud internal ($200)
Expansion boards: hard disk controller ($300)
Grounded printer cable (6 ft., $40; 12 ft., $45)
Universal keyboard adapter ($100)

Table 2. Tandy's Options for the 1000 SX.

Good Value

In spite of these problems, the 1000 SX has many attractive features; it's compact, light in weight, more powerful than an IBM PC, and expandable. For programmers it has special effects in sound and graphics. With Tandy's support, availability, and low price, you may find the SX worth the risk of some inconvenience. ■

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4 in the Fast Lane

by William H. Potter

The XLR8er Board can be installed in the Model 4/4P/4D running TRSDOS, LDOS, or CP/M. H.I. Tech Inc., P.O. Box 25404, Houston, TX 77265, 713-682-7317. $299.95.

The XLR8er package consists of a printed circuit board and the software to take advantage of it. Versions for TRSDOS 6.2, LDOS, and Montezuma CP/M 2.2 are available. The board includes a HD64180 microprocessor with a 6.144-megahertz (MHz) clock (which replaces your Z80 running at 4MHz), 256K of additional RAM, two RS-232 ports, and a high-speed parallel bus.

The XLR8er speeds program execution by 30–50 percent. Setting up the extra RAM as RAM disk makes disk-access about five times faster than normal. If only as a RAM disk, the XLR8er might be worth the investment.

The utility software lets you take advantage of the speedup and the RAM disk. To use the other features—the parallel bus, the RS-232 ports, and the additional HD64180 features—you'll need to do some assembly-language programming on the HD64180.

The XLR8er worked well with both floppy and hard disks and with a high-resolution graphics board. I found no problems using it with TRSDOS, Basic, Forth, or C.

Installation

Installation is simple: There are no traces to cut, no jumpers to move, and nothing to solder. If you need to, taking the board out again is also easy.

The XLR8er uses the Z80 socket for all its connections to the Model 4, including power, so you don't have to make any other connections, unless you want to use the XLR8er's input/output (I/O) ports or expansion bus. All you need do is remove the Z80 from its socket, install the XLR8er, and connect it to the Z80 socket via a short cable.

H.I. Tech furnishes an adhesive card guide that helps fix the board in place in a Model 4. In the 4P, you slip the XLR8er into the internal-modem slot. The installation instructions caution you to note the location of pin 1 on the Z80 socket and on the XLR8er board, but they don't tell you how to recognize that pin. It's at the notched end of the socket.

According to the H.I. Tech engineer, it shouldn't hurt anything if you plug the jumper in backwards, but it's still a good idea to get it right.

The XLR8er is about ¼ inch too narrow to fit properly into the card guides in the 4P modem slot, so you'll have to find some other means to keep it in place. I folded strips of electrical tape over one edge of the card.

You need to keep the pins for the RS-232 and parallel bus connectors from shorting to the 4P case. Since I didn't expect to use these connections, I simply put electrical tape over the connector pins. With this rig, I installed the XLR8er in a 4P with a high-resolution graphics board, though it took some rather careful folding of the XLR8er's ribbon cable.

The XLR8er manual is clear on the steps required to open the 4P and install the board, but it doesn't mention that you must take off the handle support plate (four screws) and the metal rear panel of the 4P internal case (six screws) before opening the bottom cover plate to get to the main PC board.

The XLR8er doesn't have to occupy

Circle 214 on Reader Service card.

the 4P's internal-modem slot, since it doesn't use the internal-modem connections. If you're using an internal modem in your machine, you should be able to arrange a kludge that will let the XLR8er and the modem coexist.

The Software

As stated above, you can choose one of three versions of XLR8er software. The LDOS version includes a routine that lets you run the Model 4 with XLR8er in Model III mode. The utilities let you install the system, control the XLR8er's speed and the number of wait states, and set up the additional 256K of RAM as a RAM disk. You also get a simple disassembler for the HD64180 and a utility that tells you which RAM banks are in use.

The HD64180 Microprocessor

The XLR8er is more than a Z80 with a faster clock. The Hitachi HD64180 microprocessor is designed to be an upward-compatible successor to the Z80. It can emulate a Z80 but has many capabilities that a Z80 doesn't have, like several additional internal registers, and 12 additional commands, including an integer multiply.

It has a 19-bit address bus, so it can directly address 512K of RAM, compared with the Z80's 64K. It offers a memory-management unit that lets the software select 64K out of the 512K address space to work in when it emulates a Z80.

The HD64180 chip also includes two serial ports, timers, and circuitry to control direct access to memory. All of this extra capability requires a module with more than 40 external connections, so the HD64180 comes in a 64-pin DIP package. Since it is implemented in CMOS, it requires little power.

Execution Speed

A wait state is a clock cycle during which the microprocessor waits for the rest of the circuitry to catch up. The Z80 always inserts a wait state in each I/O command. The HD64180 can insert wait states in both RAM accesses and I/O commands. You can separately control the number of each, so you can make the HD64180 run as fast or as slowly as the rest of the computer circuitry allows.

When you plug in the XLR8er and boot your machine, the system actually runs a little slower than with the Z80, because the default condition of the XLR8er puts in enough wait states to be safe. To run it at full speed, remove these extra wait states by executing SET180.

The XLR8er manual cautions you that your computer should have 150-nanosecond (ns) RAM modules for the XLR8er to run full speed. However, I went ahead and plugged in the board with the 200-ns RAMs that are in my computer, and everything works fine so far. Slow RAMs might work, but I would not count on this happening.

When running software written for Z80, the XLR8er uses a faster clock speed and offers the RAM disk to increase program execution. The XLR8er can give you even quicker execution if you program some portions of your software in HD64180 assembly, to take advantage of the additional commands and registers.

You also need HD64180 assembly programs if you want to use either of the RS-232 ports or the SB180 bus. To write programs that take full advantage of the HD64180 commands, you'll need the HD64180 manual. You can probably fool a Z80 macroassembler into generating the extra HD64180 codes for you.

The Optional Ports

If you intend to use one or both of the XLR8er's RS-232 serial ports, you'll need some additional components, a +12- and −12-volt power source, and a cable to bring the signals out to the back panel of your computer. You also need software that doesn't come with the XLR8er package. H.I. Tech can furnish the hardware components but it doesn't provide the software.

The XLR8er provides a 40-pin SB180-compatible expansion port that you can use to connect your Model 4 to the outside world and gain fast input and output for special applications.

Benchmark Tests

I ran benchmark tests to compare the execution speed of Basic programs with and without the XLR8er, and to compare the access time for floppies against that of the RAM disk.

In four program-execution tests, XLR8er decreased execution time of M/D, a series of floating-point multiplies and divides, by 31 percent; Sieve, the familiar Sieve of Eratosthenes, using integers, by 44 percent; Trans, a sequence of number-crunching trig, log, and exponential functions, by 30 percent; and Search, a search for a string of characters in a long LeScript text file, by 33 percent.

The RAM disk loaded Basic and a Basic program and LeScript and a long text file five times faster than did a floppy disk.

Summary

The XLR8er Board offers worthwhile improvements to your Model 4's performance, whether you just want to play, or reach further into its capabilities by programming its microprocessor. It will keep your trusty computer in step with this era of turbo speed machines.■

Worlds of Wonder

by Harry Bee

Fractals (Mandelbrot Set Explorer, $19.95) and **Life Experimenter & Super Spiro-Graph** ($24) run on the Models III/4/4P/4D and require a hi-res graphics board and one disk drive. Micro-Labs Inc., 7309 Campbell Road, Dallas, TX 75248, 214-702-8654.

These programs are wonderful, in the most literal sense. You can't use them to write a proposal or plot your market strategy. There's nothing practical about them. They won't even award you points. All you can do with Fractals, Life Experimenter, and Super Spiro-Graph is explore, graphically, the implications of three well-known mathematical concepts—and wonder.

Nature's Geometry

Fractals are complex curves. The Mandelbrot Set is a structure of fractal curves described by a simple mathematical function. Fractals, the program, plots contour maps of areas of the Set and uses shading to represent the third dimension.

The idea of the program is exploration, and everything about it tends to draw you deeper into the Set's fascinating geometry. The picture of the entire Set seems perfectly symmetrical at first. But looking closer you discover that, like things found in nature, it's not. . .quite. That's its lure and hook.

You can start with the complete map, or any part of it, by entering the coordinates of the area you want to look at and the magnification and resolution you want. The documentation is clear and provides good guidance. Finished maps that come with the program disk can get you started more quickly. Once you have a map on the screen, you can point to any area that catches your interest and magnify it to look at it more closely.

Each part of the Set, each map, is different from every other. Each deeper level reveals the ever more intricate structure of fractal curves that made up the level above. Exploring the Mandelbrot Set with Fractals is very much like exploring nature: discovering the cellular structure of tissue, the molecular structure of cells, the atomic structure of molecules, and wondering more.

Because the program might perform thousands of calculations to draw one screen, Fractals incorporates features to help you find your way more quickly. You can save a screen to disk, in order to return to it, and print it with a capable printer. You control the amount of detail in each map by limiting the maximum number of calculations performed. The result is a quick sketch

of an area to help you decide if it's what you were expecting.

The program also has a multipass mode that starts drawing with very little detail and doubles the resolution in each of nine passes. You can interrupt the process any time. Finally, you control the picture's contrast, and enhance certain details, by altering the range of values the shadings represent.

When all is said and done, the only thing that Fractals really does is draw pretty pictures. Yet these pictures are special. The non-linear, asymmetrical designs are not just random patterns. They have a musical beauty, and an attraction I found irresistible.

Let There Be Life

In Life Experimenter, an excellent implementation of John Horton Conway's Game of Life, your screen is a self-contained universe, and each pixel represents a life unit—a cell. A simple set of rules determines whether each cell will live and prosper, or die.

The main difference between Life Experimenter's simulated universe and the "real" one we inhabit is that in the simulation you know all the rules of a good life. Essentially, a happy cell survives; very happy, it reproduces; unhappy, it wastes away.

To play the Life game, you seed your little universe with a colony of cells by lighting up some dots on the screen, then sit back to watch what happens. The program automatically applies the rules of survival to each successive generation—alternately, you can step through the generations manually—until either all the cells die, or the "life" you started becomes stable. The object of the game is to create a successful organism.

Knowing all the rules, you would think that finding a pattern of cells that succeeds would be easy. It is not, and that is the game's challenge. Its further fascination is in finding an organism that's interesting. While some will be inanimate objects, others will oscillate, furiously or lazily. Some send off spores and trailers, and still others migrate.

Much of the fun of Life Experimenter comes from putting successful organisms together to see which will co-exist, which will compete and which prevail, and what combinations interact to produce new forms of life. The game has been around long enough that there is a stock of creatures known to be viable. The documentation and demonstration files include many of them. The program also lets you add notes to the screen, and save and print scenarios you like.

Life Experimenter's challenge is the lure of all science. There is an underlying excitement that you might at any time discover something previously unknown. Its ultimate attraction is that you'll be the one to discover an organism that reproduces itself. They'll name it after you, I'll wager.

Round and Round

If Spirograph sounds familiar, it's because you can buy Kenner's plastic version for a few dollars at your local toy store. The concept predates plastic: By rotating one circle within another and plotting the points passed by a point on the radius of the moving circle, your final is a flower-like pattern.

I just discovered two fascinating products . . . from Micro-Labs that fully justify hi-res video on a Model III or 4.

Fortunately, there's more to Super Spiro-Graph. Freed from the limits of what can be manufactured in colorful plastic and sold to grandmoms, the computer version adds several interesting dimensions. The moving circle can be larger or smaller than the stationary one, and inside or outside of it. You can place the drawing pen anywhere along the moving circle's radius, even beyond its circumference.

The program draws anything from solid lines to widely spaced dots. You can position designs anywhere on the screen, stretch them into ellipses, combine several on one screen, overlap them, add notes, save them, and print them.

Super Spiro-Graph does not have the enduring allure of Fractals and Life Experimenter, but it adds enhancements to the familiar concept that make it a worthwhile addition to the Life Experimenter disk.

Conclusion

I have no use for business graphics. I'm not artistically inclined to paint pictures. And hi-res arcade games don't much turn me on. But I just discovered two products from Micro-Labs that fully justify high-resolution video on a Model III or 4. These programs are fascinating and full of wonder. ■

Fine Print on Disk

by Andy Levinson

Legalease runs on the Tandy 1000/1200/3000 and requires two disk drives and DOS 2.x. HDG Software Inc., 54 Whitney St., Sherborn, MA 01770, 800-628-2828. $129.95.

Stripped to its core, Legalease is little more than a form book in the same family as "40 Sample Business Letters That You Can Use" packaged on disk with a shareware word processor and menu program.

This is not to say that canned forms are improper. Form books are probably the third most common text in an attorney's library, right after case and statute books. Human conduct varies, but similar situations recur.

Legalease is comprehensive when taken as a computerized form book. It consists of 157 common legal forms divided into six subject groups, such as employment forms and corporate records. These range in length from a simple letter of resignation ("Effective _____, 19__, I hereby resign from employment with the company.") to a dense, four-page, irrevocable trust. The average form is less than one page. The attorney or sophisticated user gets a book of forms he can print out.

It would have been best if Legalease stopped at this point, but it goes further. It bills itself the Legalease "System" and includes a menu-selection and a word-processing program, and it is here that the package introduces some problems.

The program uses a licensed version of Magee Enterprises' Automenu to create its menu system, but Legalease flaws its opening menu with typographical errors (e.g., "Prommisory Notes") and a disappointing help menu, which consists of text files displayed a page at a time.

To use a form, select a broad subject from the opening menu. This brings up a second menu, usually containing a narrower range of topics, and a choice from that brings up yet another menu with selections for the actual forms. But you're not there yet.

The form selection starts the word-processing program. Legalease files print exactly as they appear on screen. Rather than jumping from field to field as in a data base, you must find all empty spots (they're usually underlined, but sometimes they're just blank), insert the customized information, then delete any extra space.

Legalease neatly formats single-page forms, unless your letterhead intrudes too far into the page. All multipage forms require formatting commands. You must rename the form, print it, return to the word processor, and then return to the original menu. Not bad for a two-page commercial lease form, but tedious for the above-mentioned short letter of resignation. And this all assumes that you know what to put in the blank spaces.

Not Street Legal

The manual warns that Legalease is not a legal adviser, and it isn't. Just a few sentences in the manual introduce each form. If you know what you're doing, then the forms can save you lots of typing. If you don't, you can get yourself into trouble. For example, general releases in California invariably refer to and waive California Civil Code section 1542; Legalease's general release form does not.

Legalease offers a collection of legal forms that would cost $50–$75 in book form.

These forms can't account for statutes and codes unique to an individual state or jurisdiction. Fortunately, most states have uniform laws for commercial matters, and Legalease concentrates in this area.

The word processor is Quicksoft's PC-Write 2.6. It features direct support for numerous printers, including 18 by Tandy, and configuration files for computers with non-standard keyboards. This latter feature is important for Tandy 1000 owners, but the Legalease manual doesn't mention it.

For $75 you can register with Quicksoft and get the same support as other PC-Write owners, covering updates, phone support, complete documentation, and a newsletter.

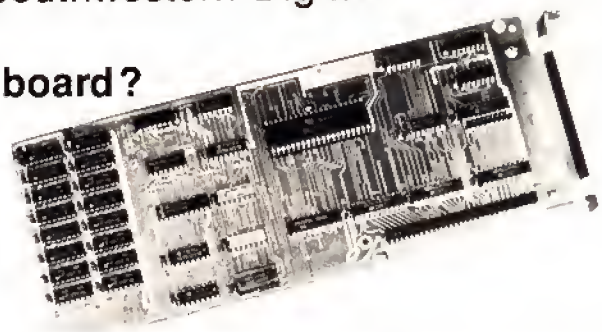
If you've got your own favorite word processor, Legalease forms are plain text files, so they'll work with any word processor that uses ASCII files or has an ASCII conversion utility. The Legalease manual mentions this option but, beyond a reference to DOS's Copy command, offers no advice for converting such files.

That brings up another problem. The menu system is written to use only PC-Write and the Legalease selection of forms. You can create, delete, and change forms any way you want, but you can't run new files from the Legalease menu.

Tandy 1000 Memory Card

another high quality product from Southwestern Digital

Why spend a bundle on a Tandy board?
Our Board is only
$135.



Features:
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- DMA
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The Southwestern Digital Memory Expansion Plus Card has all the features of the Radio Shack Board but the price; you save almost $400. Features include 512K installed, burned in, and tested to give you a total of 640K, a DMA circut that is fully tested for hard drive operation, and an expansion port that will work with any of the Radio Shack Memory Plus Expansion Card options. High quality manufacturing, and features such as gold plated card edges make this the logical choice in upgrading your memory.

Multifunction Card for 1000, 1000A

Includes 512K, RS232C Serial Port, Clock/Calendar, Plus Expansion Port, RAM Disk, And Printer Spooler ..... $239.

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20 Meg ..... $479.
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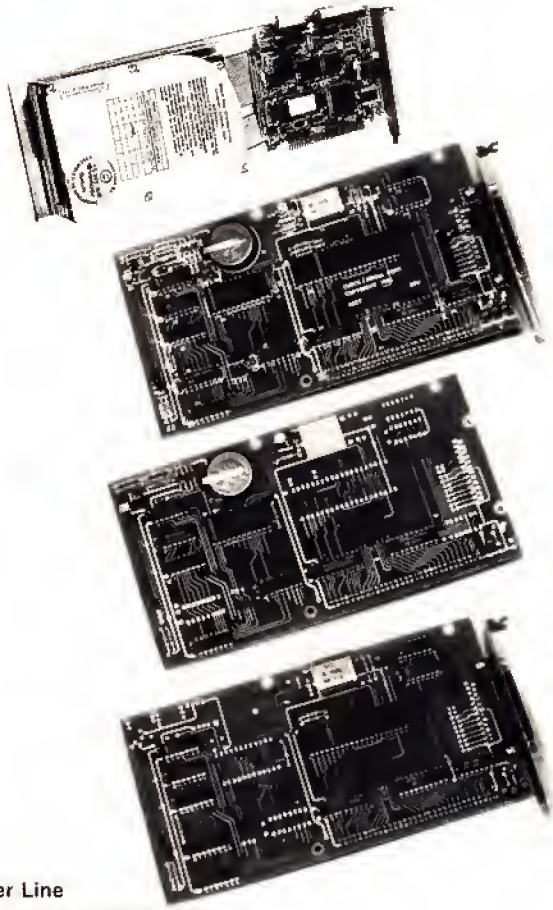
45 Meg ..... $799.



Tandy 1000 Add on Boards
Serial, Clock, or Both
Tandy 1000, 1000SX, 1000EX

The Southwestern Digital new Add-On boards were developed for use with the Plus Card Port, (a piggy-back type, add on port established by Tandy to eliminate the need for an additional card slot). These cards are fully compatible with the Memory Expansion Plus Card from Southwestern Digital and the Memory Expansion Plus Board from Tandy.

RS232C PLUS Option Board

Mounts on a PLUS expansion board, and features selectivity between COM Port 1 and COM Port 2. The RS232C output connector is the standard Tandy female DB25, and is fully compatible with the Tandy output. **$59.**

Clock/Calendar PLUS Option Board

Mounts on a Plus expansion board, and features selectivity between two ports so that you can run two clocks at one time. The Clock Calendar Board gives you perpetual time/date so that you don't have to re-input time and date into your application programs as part of your power up routine. **$59.**

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Circle 444 on Reader Service card.

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Documentation

According to the Legalease manual, if you want to create your own menus, you'll have to send $40 to Magee Enterprises for instructions on working with Automenu. Automenu is well designed, though. It was easy to learn how to modify a menu, although someone without much computer experience might not fare as well.

The manual only dedicates 15 pages to instructions on using Legalease, and some of these explain the installation procedure. Most of the manual contains printouts of the legal forms, which is convenient, because it can be easier to find a form in the manual than to go through menu after menu on the screen.

The manual has a table of contents that lists all the program's forms in order of appearance but, inexcusably, does not have an alphabetical index. The disk has such an index but it cross-references the menus on the disk. The index should refer instead to the manual or to both the manual and the menus on disk. Another inconvenience with the disk index is that you must load it into the word-processing program to read it.

Summary

Every attorney uses forms, and it is far more expensive to type 157 forms onto a disk than to buy Legalease. In addition, you're receiving a collection of legal forms that would cost $50–$75 in book form. The program, then, offers convenience and seems fairly priced. However, the forms are not specific to any jurisdiction and, therefore, might not fit every practitioner's needs. The documentation is limited, and lay persons use the forms at their own risk.

Legalease's license agreement states that only one person can use the Legalease System, and only on one computer at a time. This means that an office with more than one secretary must buy several copies of the program or limit its use to one person. PC-Write does not have the same restriction.

The system doesn't allow you to add your own forms, so you're locked into the package. If you've got a word processor and a menu program or DOS shell, there's some advantage in creating your own forms. That makes you responsible for the first draft and design, but you get just the forms you need, just the way you want them. Personally, it's the route I prefer. ■

Circle 464 on Reader Service card.

Disk-Drive Diagnosis

Investigator runs on the Tandy 1000/1200 or IBM PC/XT compatible. Dysan, 5440 Patrick Henry Drive, Santa Clara, CA 95050, 408-988-3472. $34.95.

Tandy sells the same program under the name Disk Drive Verifier (catalog no. 26-1370). Tandy Corp., One Tandy Center, Fort Worth, TX 76102. $29.95

Since your disk drives seem to read the data off your disks without any trouble, the drives must be working fine, right? Well, maybe you've had a few more bad sectors than normal lately, or for some reason your machine won't read some disks. Could the problem be just a bad batch of disks—or maybe something else?

The Investigator is a program that analyzes your disk drives and tells you if they're working within acceptable standards. If you've got a Tandy 1000/1200 and don't care about seeing the test display in color, you simply put the disk in the drive and run the verification program, PCInvest. (This program is called Verifier on Tandy's Disk Drive Verifier.)

In just over a minute, the Investigator runs a series of tests measuring the drive's speed, its ability to center a disk, the time between the leading edge of index to a reference point on the disk, the head position relative to the referenced track centerline, the head positioner's ability to return to the same location, and the disk's ability to read and write data.

After the analysis is complete, you can print out the numerical test data (see the Figure) for a service technician or just as a benchmark to help you spot measurements that begin to change from test to test.

Before you run the Investigator, enter the PCInstal file (Vinstall on the Disk Drive Verifier) to configure the program for the machine you are using. Tandy's version comes set to run on a 1000/1200 with a monochrome monitor, but the install file lets you change either default. The program supports more than 30 IBM PC/XT clones, and the color screen looks nice.

If you're one of those who's coming to depend more and more on the data you put in your computer and expect flaw-free performance from your drives, you might find the Investigator an important step in your data-protection routine.■

—Mark Reynolds

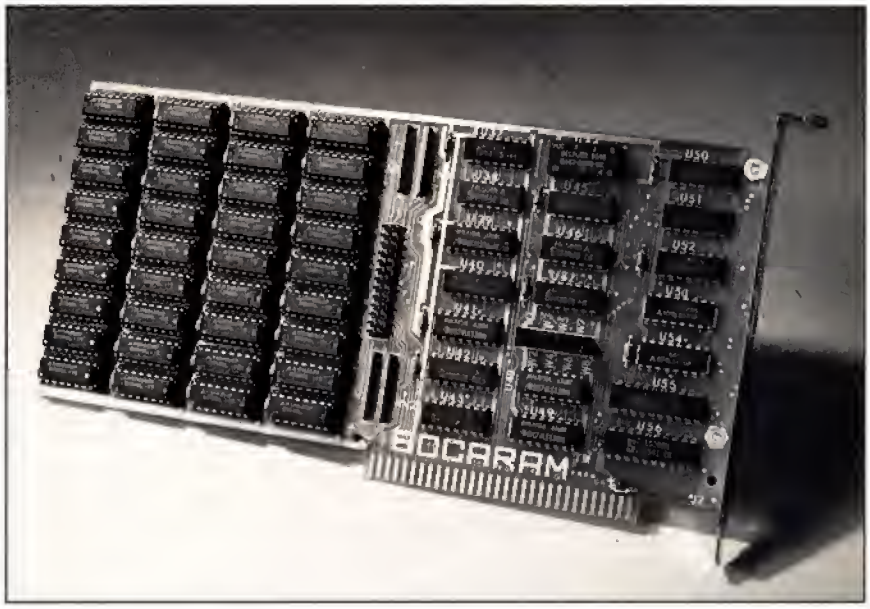

Photo. The Bocaram/XT expanded memory board fits in the Tandy 1000/1200/3000 and is easy to install.

Expanded Memory

The Bocaram/XT expanded memory board fits in the Tandy 1000/1200/3000. Boca Research Inc., 6401 Congress Ave., Boca Raton, FL 33431, 305-997-6227. $345 (1MB), $575 (2MB), $245 (1MB–2MB expansion card).

It seems like only yesterday that Intel's Above Board was a new, complex-sounding invention; today, expanded RAM is a handy commodity product. The Bocaram/XT card (see the Photo) is nothing fancy—it won't backfill to bring a smaller system up to 640K, for instance—but this product is a solid, low-priced example of the Lotus/Intel/Microsoft Expanded Memory Specification (LIM/EMS).

Installation is a cinch—take the 8½-inch card out of the box and plug it into a slot. (If it's not your first EMS card, you'll have to set a few jumpers.) A setup program automatically updates your boot files with device drivers for the card and its software options, a friendly touch that misfired when the program overwrote or scrambled the Buffers = 30 line in my existing Config.SYS file.

Once I fixed the files manually, though, the card worked fine, adding extra workspace to all the EMS-compatible software I tried (for example, I-2-3, Framework II, Words & Figures). It also has a print spooler and a swift, nifty expanded RAM disk that survives a control-alternate-delete reset. With more programs supporting EMS and with simple, affordable cards like the Bocaram/XT, there's no reason not to go ahead and go past 640K.■

—Eric Grevstad

```
Disk Drive Verifier   Version 1.01  For Tandy 1000/1200 PC

>>>> N u m e r i c a l  T e s t  D a t a <<<<

|=============================================================================|
|    Tests     Track Status   Head(0)  Status   Head(1)     Pass/Fail Limits   |
| ----------------------------------------------------------------------------|
|  RPM          0   |Pass|     300     | NA |     NA       | Range 295 - 305    |
|  Centering    7   |Pass|       8     |Pass|       8      | Minimum 8 Mils     |
|               |    |             |    |              |                    |
|  Index        7   |Pass|      51     |Pass|     223      | Range 10 - 800 uSec|
|              32   |Pass|      82     |Pass|     298      |                    |
|               |    |             |    |              |                    |
|  Radial      16   |Pass| -12  +12    |Pass| -12 .+12     | Minimum +/- 8 Mils |
|              32   |Pass| -12  +11    |Pass| -13  +11     | Delta    4 Mils    |
|               |    |             |    |              |                    |
|  Azimuth     34   |Pass| -42  +42    |Pass| -42  +36     | Minimum +/- 39 Min.|
|  Hysteresis  16   |Pass|     1.0     | NA |     NA       | Maximum 1.5 Mils   |
|               |    |             |    |              |                    |
|  Read/Write  39   |Pass|  Good R/W   |Pass|  Good R/W    | R/W all sectors    |
|=============================================================================|

|=============================================================================|
| OPTIONS:  F1  = Select Drive   F2  = Run Test    F3  = Hardcopy   F4  = Exit |
|=============================================================================|
```

Figure. A sample printout of the numerical test data produced by Disk Drive Verifier (or Investigator).

SAVE A BUNDLE

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These special bundles are ready for you to save a bundle of money. CP/M software is actually preferred because of the vast amount of programs available. The programs in these bundles have been optimized to run on the Model 4-4D-4P. For example, we have memory-mapped WordStar and it runs circles around the standard version others sell. We also added printer drivers for the Radio Shack Daisywheel II, DMP-2100 and most other Radio Shack Printers as well. You have read the reviews and know that our CP/M is the best for the Model 4. Your Models 4 and our CP/M form an unbeatable combination. Send for our free public domain software catalog and see for yourself.

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Microsoft BASIC Decoded & Other Mysteries. The complete guide to Level II and BASIC. 312 pages. Retail $29.95. NOW $24

The Custom TRS-80 & Other Mysteries. The complete guide to customizing TRS-80 hardware and software. 336 pages. Retail $29.95. NOW $24

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Carbon Copy	128
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DAC Easy Mate	24
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Fixes and Updates

Proper Rounding

I decided to introduce proper rounding to Tidbit #42 from Jim C. Cahlik (May 1987, p. 82). His program was .0000001 over the exact fractional value and rounded up to the next 64th. My version (see Program Listing 1) rounds values of ½ and over up, and less than ½ down.

I made some small changes and added some new lines. In line 20 I added double precision for old and new variables carrying fractional values. I changed 63/64 to 127/128 in line 60. Line 100 has a new H flag, to subtract 1 from NU when rounding down. In line 130 I added the MID$ routine and changed the W$ to eliminate the extra space after the slash.

Program Listing 1. A program for more accurate Basic rounding.

```
10 ''DECIFRAC' (enhanced "Jimfrac" by Jim C. Cahlik 01/21/87)
15 'with exact rounding by Henry H. Herrdegen, 87/04/18.
20 CLS:DEFDBL A-G
30 LINE INPUT"Enter Decimal (xxx.xxxxxx) : ";U$
40 GOSUB 50:PRINT W$:GOTO 30
50 A=VAL(U$):B=INT(A):D=A-B:C=(INT(D/.015625))*.015625
52 E=(D/.0078125):F=INT(E):G=E-F
54 IF F/2=INT(F/2)AND G>0 THEN H=-1 ELSE H=0
60 IF D>=.9921875 THEN B=B+1:C=0:GOTO 80
70 IF B+C<A THEN C=C+.015625:GOTO 70
72 IF C=1 THEN C=1.00000001
80 U$=STR$(B)+STR$(C):V=INSTR(U$,".")
90 IF V=0 THEN W$=STR$(B):RETURN
92 IF D>=.9921875 THEN 60
100 C=INT(C*1000000):NU=(C/15625)+H:DE=64
110 IF NU>2 AND DE/2=INT(DE/2) AND NU/2=INT(NU/2) THEN
DE=DE/2:NU=INT(NU/2):IF NU>2 THEN 110
120 IF NU=2 THEN DE=DE/2:NU=NU/2
130 DE$=MID$(STR$(DE),2,2):W$=STR$(B)+STR$(NU)+"/"+DE$
140 RETURN
```

End

The new line 52 checks for the rounding point in the middle of the 64th. Line 54 sets the H flag, which assists in rounding down. Line 72 reintroduces a decimal point if C appears without one. Line 92 catches rounding to the next whole number after line 72.

Changing to fractions other than 64th is now more involved, but should not be difficult if you follow Jim's original suggestions, once you have figured out how the line numbers in the text relate to the ones in the program listing. You have to change the values in lines 52, 60, and 92 to the new intermediate values (64th to 32nd, and so on).

Henry H. Herrdegen
Windsor, Ontario

Ed. note: The original listing was renumbered and references to the lines in text were incorrect. Sorry!

Better Filekeeping

I updated my Filekeep program ("Good Filekeeping, August 1986, p. 60) so that it reads both single- and double-sided disks and gives information about disk free space. If you are interested in receiving a printout of the changes you need to make, which include revisions of a number of lines of the existing listing, send a self-addressed, stamped envelope to Technical Department, *80 Micro*, 80 Elm Street, Peterborough, NH 03458.

David Kuzminski
Petersburg, VA

Superscripsit 1.02.00 Patch for DOS Commander

I adapted Randall K. Wright's Superscripsit DOS Command patch so it worked on version 1.02.00 of Model 4 Superscripsit. The SCR17/CTL file was rewritten for this version. Randall's program code and message blocks replace a contiguous area in the SCR17/CTL file. In the new version of Superscripsit, the corresponding area is in several places: a 77-byte block in the first record and

Continued on p. 80

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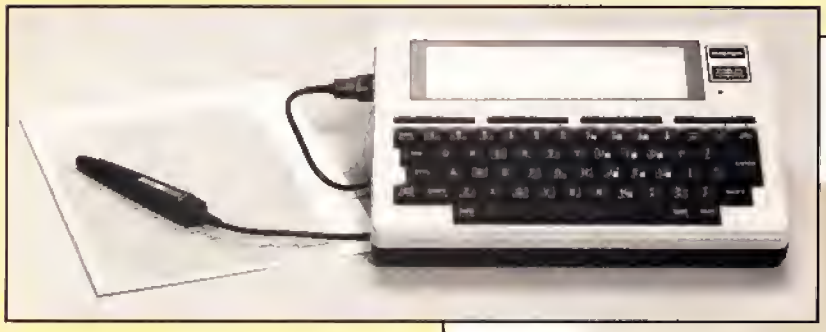

The Tandy Story

It all started 10 years ago in a converted used-car showroom . . .

by Ron White

By any logical assessment back in the 1970s, no one should have built a microcomputer to sell to a mass market. A few hobbyists were building computer kits that, more than anything else, tested their builders' endurance and patience. They certainly didn't do anything as useful as balancing a checkbook or even playing Space Invaders. The typical home consumer and small business weren't shouting for their own computers. If most people thought about computers at all, it was as hulking giants that occupied air-conditioned rooms and were attended by white-robed priests who spoke in arcane terms about "kilobytes," "BIOS," and "dynamic RAM."

Still, some thought there might be something to these new machines. These people were the hardware hackers, mostly on the West Coast, who pursued personal dreams in garages and one-room rented offices. The established computer companies—IBM, Hewlett-Packard, Digital—weren't interested in downscaling their big machines into hobby-shop toys. But one established company thought there *might* be a future in building and selling a small computer. It wasn't a computer company. It was Radio Shack, located in Texas, equally far from either of the hotbeds of computer innovation surrounding San Francisco and Boston.

Radio Shack and its parent company, Tandy, had never built a computer before. Their specialty was electronic parts for do-it-yourselfers and low-cost consumer electronics.

If anyone had thought about it back then, Radio Shack might have seemed an unlikely candidate to help launch the American microcomputer revolution. But some people at Tandy did think about it and

decided that microcomputers might be the latest fad—like the CB radio market that had just boomed for a year or so and then quickly went bust. The executives at Tandy figured it was worth a gamble—a small gamble. They never suspected that microcomputers would go on to change the structure of American business and that Tandy would become a major force in that change.

Abhorring a Vacuum

No one in the twin granite towers of Tandy's Fort Worth headquarters remembers the exact moment someone there conceived the idea of building a microcomputer. But in 1976, Tandy was looking for a market to exploit. The bottom had dropped out of CB radios, which had been a big moneymaker for Radio Shack stores. The loss of CB sales was not going to bankrupt Tandy with its diversified product line. But the loss left a vacuum in Tandy sales.

At the same time, some of Tandy's electrical engineers were ordering something called the MITS Altair 8800 from an obscure company in New Mexico. The Altair was something only a hobbyist could love; it had no keyboard and no video display, and it had absolutely no practical use. But a lot of people were buying it, and a lot of the electronics magazines were writing about it.

John Roach, a Tandy executive, read the articles and noticed the company's engineers talking enthusiastically about their new toys. Roach thought Tandy should at least be looking into the new fad. A no-nonsense Texan with math, physics, and MBA degrees from Texas Christian University, Roach's background was in computers. He had managed the data-processing department for Tandy before becoming its vice president of manufacturing. It was experience that would eventually prove valuable in the development of Tandy computers, which in turn would help boost Roach to chairman of the board and chief executive officer at Tandy.

The engineering and merchandising departments got together to design a product that might appeal to the same people who were buying the Altair. The engineers came up with a plan for a computer kit that would outdo the Altair; it would have a keyboard and a monitor—more or less a real, functioning computer instead of an experiment for electronics freaks. Although the kit idea more than matched the marketing of the Altair, it was nixed by Bernie Appel, then vice president of merchandising and now president of Tandy's Radio Shack retail division. Appel decided that even Radio Shack's staple customers, who were no strangers to the soldering iron, could never put together something as complex as a computer.

"We decided there were too many problems likely to be encountered by the customers," Roach recalls. "The chips were sensitive to electrostatic discharges, and it was actually harder to test the parts unassembled than it was assembled."

A kit would also require extensive, layman-language instruction manuals and would create nightmares for Radio Shack's service department. So the company decided to do what, until then, no company had ever done before—sell a totally assembled microcomputer, complete with keyboard, monitor, processor, memory, and a programming language. It was not something any company, even one with the extensive in-house manufacturing experience that Tandy had, could whip out quickly. That's where Steve Leininger came in.

Something Was Brewing

Leininger was a member of the Homebrew Computer Club, the loose hodgepodge of computer hackers located in what was coming to be called Silicon Valley. The club was where another electronics nut, Steve Wozniak, was showing off a rudimentary circuit board that would eventually become the Apple computer and Radio Shack's most serious rival. Leininger, like many other members of Homebrew, had designed and built his own computer—two or three of them, in fact—and he attended the twice-monthly meetings of the club, where the concepts of proprietary information and making a fortune did not yet exist. Instead something called the "Hacker Ethic" reigned. Members freely exchanged ideas and designs and occasionally "liberated" software or even microchips from companies with reactionary ideas about property rights.

In contrast to other members of Homebrew, Leininger was more conservative, meaning that he bathed regularly, got haircuts at least semi-regularly, and was married to a flesh-and-blood woman instead of a growing conglomeration of wiring and electronic components that other members spent their nights with. Leininger even had a regular job, designing chips for National Semiconductor. That's where several executives from Tandy, led by Don French, met Leininger as they were on a fishing expedition to electronics manufacturers to find new technology that they might use in Radio Shack products.

Leininger was introduced to the Tandy representatives as someone working on a tiny version of Basic to be incorporated into a cheap microprocessor. While they were talking, the Tandy visitors mentioned that they'd like to see one of the California computer shops they'd heard about. Leininger gave them directions to the Byte Shop in Santa Clara, the second store to open in a chain of shops that specialized in selling computer components to hardware hackers. Later that day when the Tandy executives visited the shop, the person greeting them from behind the counter was Leininger, making a little extra money moonlighting.

After the executives were back in Fort Worth and the discussion turned to hiring someone to design a microcomputer, French remembered this kid in California. Not only was he versed in programming and hardware, he had experience in the soul of Tandy operations, electronics retailing. He seemed like a good candidate for the job.

The call Leininger received from Tandy was well-timed. He had been unhappy at National Semiconductor because he had been passed over for stock options. Leininger's wife, to whom he had been married for six months, had a master's degree in geology, but the best job she could find was the breakfast shift at McDonald's. Tandy wasn't offering much more money than Leininger was making at National Semiconductor, but the fact that Texas has no state income tax and that they would be in the middle of oil country made Leininger accept the job.

"Almost the universal reaction from my family and friends was, 'You're going to work for *Radio Shack*?' " he remembers. "Radio Shack had this hyper-schlock image—you know, buying out-of-spec parts, that sort of thing. I think they finally woke up to that about 10–12 years ago, but it's taken a lot of work to get to where they are now—almost respectable."

The Department That Wasn't

When Leininger arrived in Fort Worth in 1976, he discovered the company wasn't set up to build microcomputers.

"There was no department for building computers," says Bill Schroeder, who later helped create one of the operating systems for the new machine. "There was no one to manage the manufacturing. There was no lead time for the acquiring of software products—none of this stuff."

The lack of any master plan for going into the computer business would have surprised no one familiar with Tandy in those days. It was still run in an informal seat-of-the-pants style that had characterized it since 1918 when Dave Tandy and his partner, Norton Hinckley, bought a supply of shoe leather for resale to cobblers throughout Texas. When Tandy's son, Charles, took over the business, he created a couple of retail outlets to sell supplies to leather-crafting hobbyists of the type he had run into while serving in the Navy in World War II.

The shops were a success and led to more outlets. In 1952 Tandy acquired a failing manufacturing plant in New England. The acquisition established a pattern for all Tandy operations, including its future venture into computing: The only products carried in its stores would be those with house labels on them, either made in Tandy's own plants or made by other firms exclusively for Tandy.

By 1961 Tandy had 125 stores. The following year Charles Tandy came across Radio Shack, a chain of nine retail stores and a mail-order company in the Boston area that catered to ham-radio operators. He quickly whipped up a deal that in three years gave Tandy 85 percent ownership of

Radio Shack. At the same time it turned Radio Shack's $4 million of red ink into a profit with $20 million a year in sales. The stores by then represented 40 percent of Tandy's income.

The number of Radio Shack stores continued to grow. By the time Tandy began thinking seriously about building computers, it had thousands of Radio Shack outlets worldwide generating pre-tax profits of over 40 percent. While hobbyists continued to prowl its ever-present bins of electronic parts, the stores had diversified into consumer electronics: TVs, stereos, games, and novelties.

For all its big-time success, however, there was a conspicuous lack of formal planning. A typical marketing strategy didn't involve expensive studies that spilled out a lot of gibberish about demographics, product positioning, or image building. Instead the stores simply stocked a minimum inventory of a new product. If it sold well, the stores increased the inventory; if the product was a dud, the loss was bearable. The strategy has caused Radio Shack to miss some opportunities. During the Christmas season of 1983, Radio Shack stores ran out of video cassette recorders because management wanted to keep inventories low until they saw if VCRs, then only two years old, would catch on. It's a safe, conservative strategy, and if it means that at times Tandy missed the opportunity to win big, it also meant it rarely lost big.

It was this same no-frills approach that Leininger encountered when he and his wife moved to Fort Worth. Even the executive offices in 1976 made no concession to the trappings of success. Located in a former factory just west of downtown Fort Worth, the headquarters of Lewis Kornfeld, then Tandy corporate vice president and president of the Radio Shack division, had a permanently waterlogged rug from a leaky ceiling. Add to this low-rolling attitude the fact that no one at the time was confident there was a market for a microcomputer, and the orders given to Leininger began to make sense.

The Profit Margin Of a New Machine

At first, the young engineer from California was told that he would have to design a computer that could be sold at under $200 retail. (The Altair, by comparison, sold for $397, and that was for a kit without a monitor and keyboard.) A $200 retail price translated to a design that cost no more than $80 to manufacture—$60 for parts and $20 for putting them all together. The original plan called for no monitor and a membrane keyboard.

After working at this plan for a while, Leininger went to Roach and French, who had become his boss, and pushed for added features that would raise the price. To be a workable computer, it would need a decent keyboard that would feel like the typewriter keyboards office workers were used to.

WHERE ARE THEY NOW?

by David Essex

MICHAEL SHRAYER, Author of Electric Pencil

Michael Shrayer, creator of Electric Pencil, the first word processor for microcomputers, is living the good life in California. For him, the good life involves more than material wealth: it means spending time with friends, hanging out on the beach, and staying healthy. The 52-year-old former commercial film director and television repairman said he moved to the West Coast in 1970 to "do all those things Californians are known to do," and that has included trying out "alternative lifestyles." Soon, he will sell his house in Glendale and roam the continent in a mobile home.

Like many entrepreneurs in the early TRS-80 days, Shrayer stumbled into computing as a curious amateur and ended up creating an influential product. A lifelong electronics hobbyist, Shrayer programmed an editor/assembler for the early MITS Altair computers and needed to write the documentation. It occurred to him that the Altair could be programmed to do the job of a typewriter, and months later he had the first crude version of Electric Pencil debugged and running. Tape and disk versions eventually followed on the Model I, and Electric Pencil enjoyed great popularity and influence. Seventy-eight versions were written for various computers between 1976 and 1980.

Shrayer's involvement with Electric Pencil ended in 1981 when he sold it to publisher Harv Pennington (see the profile of Pennington elsewhere on this page). He retired shortly thereafter. Investments were the key to Shrayer's wealth, not Electric Pencil. At one point, he lived in a "mini-estate" in Palm Springs and owned a Mercedes-Benz and a Datsun 280Z. He gave that up for the more modest life he now leads.

Shrayer's latest venture is a small local company called Not Just Another Sandwich, which makes and distributes sandwiches with unusual fillings—a Chinese chicken sandwich is one of the offerings. But while he remains open to entrepreneurial opportunities, Shrayer isn't thinking about money and influence much anymore. He said he has started to realize that material things are less important than spirituality and having fulfilling relationships. "It seems that all the accoutrements of rapid wealth don't mean as much anymore," he said.

The personal computer industry has become less personal and more of a big business, in Shrayer's view. "It's gotten very serious and aligned itself with the rest of the world. The camaraderie is no longer there. It's a way to make a living."

HARV PENNINGTON, Book Publisher

When the first inscrutable Model I's and IIIs came out, someone had to help the public understand them. Harv Pennington, a former commercial artist and cartoon illustrator, was the man. His IJG Inc. was transformed from precious stone dealer to publisher of such titles as *Basic Faster & Better* and *TRS-80 Disk and Other Mysteries*. The oversize paperbacks with cartoons on the covers became best-sellers—not quite on the *New York Times* list, but for a fledgling industry they were impressive. Approximately 900,000 have been sold, according to Pennington.

Today, Harvard C. Pennington, 49, does consulting, teaching, and free-lance writing in Walnut, CA, about 35 miles east of Los Angeles. IJG went bankrupt last year, the victim of Tandy's move away from TRSDOS into MS-DOS. In 1981, Pennington acquired the rights to Electric Pencil from Michael Shrayer and had a second TRS-80 version written in machine language. Later, with the help of two partners, he developed a version for the IBM PC and compatibles that is sold today. Pennington and his partners sold the Electric Pencil rights to a Dallas company last year.

Among Pennington's current writing projects is a book called *The Great Messier Marathon Handbook*, which is targeted at amateur astronomers. Charles Messier was a French astronomer who cataloged 110 "nebulosities" so that people wouldn't mistake them for comets. Pennington's book is a guide to a yearly marathon in which people try to spot all 110 nebulosities in an 8½-hour period.

Pennington's other interests include history, competitive silhouette shooting (a current project involves changing the caliber on a Colt 1911 handgun), and some free-lance graphics work on his Macintosh. He hopes to write history books eventually and has a tentative outline for a book about the Soviet Union called *Modern Mongol*.

"To some extent, all microcomputer word processors owe their success to Electric Pencil." IJG President **Harvard Pennington**, "80 Micro *Hall of Fame,"* 80 Micro, *January 1983, p. 396.*

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Pop Quiz

SWEEPSTAKES

1. Does your Model 4 speak XZ#M%S? Who helps it speak ASSEMBLER, BASIC C and RATFOR? _____
2. Which Tandy dealer donates to charity with every purchase? _____
3. Who's the "mad genius" behind all those Zuckerboards? _____
4. Even the Marines will be singing in the halls when they save a bundle with what company? _____
5. Who welcomes telephone orders with a $2.00 credit towards purchases? _____
6. Who offers The Solution! to power problems? _____
7. They're going to take your Model III or 4 (in 3 mode) to the year 2000. _____
8. These colorful guys on Constitution Avenue sell the TTX printer. _____
9. You don't have to be a professor to know who sells quality tools for handicapping sports. _____
10. Who has a low-cost product, has been an "innovator since 1978", and "eclipses all other hard disk solutions"? _____
11. What Garden Grove company "grows" modems specifically for 4P users? _____
12. Cornucopia/Software Sales designed it so you won't say its name while you type. _____
13. They're "The Technology Store." Who are they? _____
14. Deep in the heart of Texas, this company offers all Radio Shack software at 20% off catalog prices. _____
15. Microdex cut the price of the xT.CAD. How much do you save? _____
16. If you want the next generation operating system for your 4/4P/4D, it's only logical to contact... _____
17. This Texas company brags its hard drives are the ultimate expansion for your Tandy. Name the company. _____
18. It's cold in Minnesota, but if you call 1-800-248-3823 you'll get hot prices from what firm? _____
19. What size check do you have to send Howe Software for its Home Budget & Checkbook Analyst? _____
20. They've been selling "Mail Order Electronics • World Wide • Since 1974." Name them. _____
21. Whom do you have to connect with down in Texas for prices just 8% over wholesale? _____
22. Uh, oh! Micro-Labs says the price of its unique Grafyx Solution package is $199.95. What's the true price? _____
23. If you want to toss out your No. 2 pencil and get into word processing, what package can get you going in 20 minutes? _____
24. It's nothing but plus after plus when you deal with this Bay State dealer. _____
25. The name may sound French, but this software was named the No. 1 choice in word processors. _____
26. The grapevine says this computer center has great prices 'cause it's real close to the Tandy warehouse. _____
27. What system makes your Tandy 1000 and 1000A faster than an SX for $99.95? _____
28. Whose business graphics toolkit is so fine they named it after a great Dutch painter? _____
29. Missouri's the "Show Me State." And this Summersville dealer shows you a complete line of printer ribbons. _____
30. Don't drive to Dallas for a deal on "low cost hard disk drives for your TRS 80". Who's the dealer to dial? _____
31. It costs $699.95 and the software is free! You'd be smart to buy an IBM clone from this company. _____
32. Complete this phone number: 1-800-FOR-____. Hint: It connects you to Roanoke, TX and low prices. _____
33. Whom can you run to for a Pro Football prediction program that was 61% + accurate in '86? _____
34. This warehouse introduces the Turbo XT/AT Personal Computer and lots of extras if you need 'em. _____
35. Name the world's largest independent authorized computer dealer. _____
36. Which version of Forth programming language allows use of the same data disk in IBM PC/XT/AT/PS2, Tandy 1000, TRS-80 Model III/4 and even the original TRS-80 Model I? Name the maker, too. _____
37. Name the "final ingredient" that dramatically extends the use of Deskmate and Deskmate II? _____
38. Hi! Who makes the XLR8 Upgrade Board that extends the life of your Model 4? _____
39. In spite of its funny name, this could be "the best computer value in America." Get serious and name the computer. _____
40. For the TRS-80 user who loves surprises, who offers a Grab Bag worth over $200 for just $38.95? _____
41. Time to convert! Name the firm who can save you $100s when it's time to make your printer IBM-compatible. _____
42. Down in Granbury, Texas, they claim to be "The Saving Place for all Tandy Computers and Printers". _____

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Please specify your current computer system: ☐ Model I ☐ Model III ☐ Model 4 ☐ Models 1000, 1200, or 3000 ☐ Color Computer ☐ Other ☐ 100, 102, 200, 600

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And it really should have a monitor.

"That raised the retail price to $499," Leininger says. "But that didn't give Tandy the profit margin it was used to. Finally for $599 we were able to get the whole computer with off-line storage in a cassette recorder, Basic built in with floating-point computation, with a screen and a good keyboard."

The choice of the microprocessor was crucial. At the time there were only a few likely candidates for the job: Zilog's Z80, Motorola's 6800, Intel's 8080, and a couple of chips made by National Semiconductor. Despite his familiarity with the microprocessors made by his former employer and a considerable knowledge he had acquired on the 8080, Leininger went for the Z80. It had what he considered a better set of instructions that meshed nicely with the Basic Tandy was picking up from Microsoft. (Microsoft's Basic was chosen because it was already being used on the Altair, which at that time was enough to make it an industry standard in an industry that barely existed.) But the main factor in favor of the Z80 was its "automatic RAM refresh," which would allow the new computer to use twice the memory that it could with other microprocessors—for the same amount of money.

This was a big achievement at this stage in the fledgling industry. Tandy's computer would offer at least 4K of memory at the same time that 256 bytes were standard on the Altair and while other microcomputers rumored to be in development were only planning to have 2K. The Z80 also would allow the memory to be expanded even further with the use of 16K memory chips that would soon be commercially available.

The Blessing

Tandy at first was Spartan about staffing the project. For months only four people, under Roach's direction, worked on the new computer. French, who bought electronics parts for Tandy and was something of an amateur computer hacker, was the on-side coach overseeing the day-to-day progress. Leininger was both designing the hardware and writing a make-do operating system (a more extensive operating system would soon be farmed out to an independent programmer, Randy Cook). Van Chandler was pulled in from Tandy's data-processing department to write applications software. And Dave Lien was writing a manual to accompany the computer's Basic.

For months, the only ones who knew where the project stood were Roach and his team. Kornfeld knew that they were doing something with a computer, and he would sometimes stop by the converted used-car showroom where the new computer staff worked to see how things were going. Kornfeld would look at the tangle of wires and strange components that was supposed to be a computer.

"I'd say, 'We'll order it the day it can play chess with me and nobody from engineering has to hold the wires together or tell me "it was working just a minute ago, but. . ." ' " Kornfeld wrote in his book, *To Catch a Mouse, Make a Noise Like a Cheese.*

Around the beginning of 1977, after about six months of work, the team had a prototype of the computer ready to show off, and Roach called Kornfeld over to look at it. On his way to the windowless conference room where Roach's team had set up the prototype, Kornfeld saw Charles Tandy by his black Continental. Until now Tandy didn't know about the plans for a new product that Kornfeld and Roach were about to suggest they sell for a price higher than anything Radio Shack had ever sold before. Kornfeld figured now would be as good a time as any to let Tandy in on it.

With Tandy and Kornfeld giving this new contraption a hard look, Leininger booted the computer, and it worked, without him holding any wires together or making any excuses. Of course, at this stage in the development, "working" didn't mean that the apparatus did very much, certainly not play chess with Kornfeld. But Roach and his crew explained what the computer *would* be able to do—eventually—with the right programming.

"Who wants a computer?" Tandy asked.

Kornfeld dutifully pointed out that they didn't know if *anyone* would want to buy it. Except for some dedicated hobbyists, no one out there was demanding his own computer. What they had in mind was a computer for small businesses and schools, a market that didn't exist because the product had never existed. What's more, Kornfeld added, the economics of buying parts meant that initially they would have to commit for 1,000 units.

Tandy was intrigued by the machine and said he figured that it would be worth the publicity even if the thing didn't sell.

Roach then added that, actually, 3,000 would be closer to the number they would have to commit for.

Tandy thought this over for a while. Finally they decided that since there were about 3,000 Radio Shack stores in the United States, if the new product was a bust, they could give one to each of the stores to keep their books on or to do inventory. . .or something.

The only person there who was convinced the project would be a winner was Leininger. He told Roach that even with the price at $599, he thought they would sell 50,000.

Roach's assessment of that prediction was succinct.

"Horseshit," he said. Tandy had never sold that many of anything at that price.

Leininger's reasoning was that by the time you equipped an Altair with a monitor—the cheapest available was $795—you had spent more than $1,000. And the demand for Altairs, which were kits, was so great that they were months behind being delivered.

When Tandy left the room, Roach's team still didn't know if the project was on or not. It wasn't until Feb. 2, 1977, that they got the official go-ahead. The new machine, which Kornfeld named the Radio Shack TRS-80 Microcomputer System, was scheduled to debut in New York on Aug. 3 the same year.

Saddling Up

Soon Leininger's wife of less than a year learned to tolerate the 18-hour days he put in seven days a week. The team grew to seven people and moved into a former insulin factory where Tandy hi-fi speakers were made. For the final stage of the job, the actual building of the first units, the crew took over the upstairs floor of an abandoned saddle factory.

Some of the work was farmed out. At first none of the big video companies was interested in supplying monitors, possibly because Tandy, ever conservative, was asking them to supply only a few thousand. Finally RCA agreed to provide a 12-inch TV receiver stripped of its tuner, speaker, and assorted other circuitry. RCA also threw in a silver-gray cabinet that established the aesthetic design for the rest of the computer.

Tandy designed a custom keyboard, which also contained the guts of the computer, the microprocessor, and other circuitry. A separate interface unit that would allow the computer to be expanded with other circuit boards and external peripherals was in the works, but for the August debut, the staff concentrated on just the keyboard/processor, monitor, cassette recorder, and enough software so that a buyer could turn the thing on and actually do something with it.

Not long after the team began working in earnest, Roach made a trip that for the first time convinced him they might be on to something. In April he went to California to attend the West Coast Computer Faire, a convention of computer hobbyists and what few manufacturers existed at the time.

"I saw 12–14,000 people, most of them paying $9 a head and waiting in long lines to get in," he says. "I thought maybe I really was looking at the rudiments of an industry."

During the summer of 1977, the staff labored in the old saddle factory, handbuilding the first 25 units in time for the kickoff to be held in just a few weeks at the Hotel Warwick. Then with only a month to go, Leininger ran into a problem he couldn't figure out. The invitations had already been sent to the trade publications, advertising brochures were already in the works, and Leininger was sitting in front of a TRS-80 that refused to communicate with the cassette recorder.

The 18-hour days were getting to Leininger. He was burned out. For two weeks he wrestled with the problem. Every time

he made a change and hooked the computer to an oscilloscope, the machine tested fine. But when he hooked the computer to the cassette, nothing happened.

"I got to the point where I just didn't know if I could figure out what the problem was," Leininger recalls. "I told my boss about it, and he said he'd be in serious trouble if I didn't get it to work.

"Finally after working on it all night, about 2 a.m. nature called. I went to the men's room with a listing of the program. While I was sitting there I found the problem."

The New York Debut

When the TRS-80 was officially unveiled on Aug. 3, Roach was disappointed at the initial reaction by the press.

"Only a few radio hi-fi types showed up," he remembers. "The general-interest publications didn't care about microcomputers at that time. The technology analysts clearly didn't believe the microcomputer was anything of significance. They couldn't relate to the tremendous gap between stand-alone computers and minis."

But while the trade press was underwhelmed at the debut of the TRS-80, the public was overwhelmingly enthusiastic about the computer. Radio Shack stores were soon flooded with orders—more than they could fill for months.

Harvard Pennington was typical of the type of person who saw what the TRS-80 could give him. Pennington would later make a lot of money writing books that explained how to get around some of the TRS-80's flaws, and he would even sell a program called Electric Pencil, written by Michael Shrayer and one of the first word processors. Note that Pennington was not a hacker. The closest he had ever come to programming was working with a fancy Texas Instruments calculator.

Pennington used the calculator in an effort to cash in on the diamond market, which in 1977 had gone crazy. He had seen a program that ran on a mainframe that tracked the diamond market, but it was too expensive to rent the terminal time. He studied the program and figured out how it kept track of the many variables involved in trading diamonds. There was too much data involved for even a powerful calculator like the TI 57. That's when he decided to get a computer.

Apples, Pets, and Choices

In 1977, Pennington didn't have many choices for a personal computer (a term that hadn't been invented yet). He didn't want to build a computer from a kit, and only three ready-built computers were available: the Commodore Pet, one available only by mail order from Ohio Scientific, and the TRS-80. (The only Apple computer at that time was the Apple I, which was a kit; the fully assembled Apple II wouldn't be ready for mass distribution until the next year.) Pennington doesn't remember why he rejected the Pet. "May-

"It's going to be another Model I—a popular machine with a lot of independent software being written for it." Model I creator **Steve Leininger** *on the Model 100, C-Notes, 80 Micro, July 1983, p. 167.*

Not one to mince words, Pennington has some things to say about the course the computer industry has taken since the introduction of the Model I, which he believes has never been put to full use. Today's software and hardware companies cater to people's perceptions of what's desirable without teaching them how to use computers effectively. Summing up his feelings of how the reality of computing compares with his early hopes for it, Pennington said, "I'm crushed. We never realized its potential."

STEVE LEININGER, Designer of Model I

To the average person, the Steve who was big into personal computers was Jobs of Apple. But when Steve Leininger calls himself the Steve Jobs of Tandy, the notion doesn't seem exaggerated or self-aggrandizing. History records that Steve Leininger is the man who designed the Model I.

Now 35, Leininger lives with his wife and three small children and their dog in the Dallas suburb of Arlington, TX. After working as a consultant for two years, Leininger is now starting a company with Larry Atwell, who did the mechanical and plastics work on the Model I. The new company will manufacture computerized measurement devices for physical therapy, such as instruments that measure hand tremors in patients with Alzheimer's disease.

Leininger had two stints at Tandy. He left his job as an electrical engineer at National Semiconductor in 1976 to consult Tandy in developing the Model I and remained there until 1981. After two years as an independent consultant, he returned to Tandy for 1½ years and then went back to consulting for several large hardware developers. He walked out on one company that ignored his advice by going ahead with a small-screen portable that Leininger knew would be outclassed by Tandy's soon-to-be-released Model 100.

Two of Leininger's passions are electronic music and restoring cars. He worked at a music store in his home state of Indiana and took computer-music courses while earning his bachelor's and master's degrees at Purdue University. Nowadays, he does some composing—"just enough to amaze myself"—and plans to get more involved in music. Meanwhile, he is restoring a 1960 Corvette. "I guess I've always been a tinkerer," Leininger said.

When asked how the business has changed over the years, Leininger said it has become "a marketplace of standards" that is expensive to get into. "You either go it alone big, a la Apple, or you go into IBM compatibles," he said. He feels Tandy's progress has been somewhat disappointing. "I'd hoped Tandy would position itself to do some pioneering work along the lines of a Macintosh product." Instead, Fort Worth has opted for "innovation within bounds"—the bounds of IBM compatibility.

With his new company, Leininger himself remains on the leading edge of technology.

KIM WATT, Creator of Super Utility

Like all new computers, the Model I could not have prospered without a wealth of software and literature to support it. Programs that help you work smarter and faster have always been popular, and in 1978 Kim Watt saw the need and filled it with Super Utility, a package of more than 80 machine-language programs for such mundane tasks as data recovery and file management. It is still being sold.

Watt is another early pioneer who came to computers almost accidentally. While a pre-med student, he bought a Model I to help with his course work and ended up using it to write a program for an accountant friend. More programs followed, Watt left his name at the local Radio Shack store, and soon he was working nights to fill orders. He never made it to medical school.

Watt formed his own company, Breeze Computing, to market the 100 programs he had written. In 1981, he moved to Dallas and formed a partnership with Dennis Brent, whose marketing expertise was the perfect complement to Watt's programming genius. Software with names like Powermail and Powerdraw followed, so it seemed logical to name the company Powersoft, of which Brent remains president today.

Watt sold his part of Powersoft in 1983 and moved to Milwaukee to do general contracting for Bill Schroeder, president of Logical Systems Inc. One year later he took his current job at the automation products division of Square D, a Fortune 500 company based in Milwaukee. Watt is now the division's group leader for software and works on programmable controllers for a wide variety of automation applications, including control of airport runway lights and baggage handling. Now 34, Watt is an avid sportsman, enjoying golf, volleyball, sailing, fishing, and camping.

Microcomputing has changed largely the way Watt thought it would, although he is amazed by the technical advances. Speech recognition, however, is one field that hasn't lived up to his expectations. The business side of computers has changed in a way that makes it unlikely for anyone to repeat Watt's success today. "When the home computer first came out, anything you wrote was easily salable," Watt said. "The competition today has become very fierce."

be it was the name," he says.

He borrowed an Ohio Scientific for a few days, long enough to figure out Basic, but he didn't buy one because the company refused to answer his questions when he called. ("Scientific dorks," he calls them today.)

Then he went to a Radio Shack and saw the TRS-80.

"There was something about it," he recalls. "A little bell went off in my head."

Although the early TRS-80 was relatively primitive, Pennington was impressed by the add-ons Tandy was promising: more memory, a disk drive, and an Expansion Interface. A printer was also available.

"It had no tractor feed, just used rolls of paper without perforations, but it was a real printer," he says.

Pennington placed his order, and after waiting several weeks, the computer was ready for him to pick up. Writing his first program wasn't easy, but eventually he got the job done and "it was a very good program," he says.

The Deluge

Pennington wasn't the only one who saw the possibilities of the TRS-80. At the time of the Aug. 3 debut, only 25 TRS-80s existed. Within weeks of the introduction, Radio Shack stores had taken thousands of orders for it.

"We were almost immediately deluged," says Ed Juge, today the company's director of market planning. He joined the company in the spring of 1978 while Tandy was trying to cope with the demand for TRS-80s. "At one point we were nine months behind on delivering Level II ROMs, six months behind on disk drives."

Both Kornfeld and Roach took a lot of phone calls from irate customers demanding to know why their TRS-80s hadn't been delivered.

"At the time we introduced them, we didn't have the infrastructure to handle back orders," Roach says. "We didn't have the people for customer services. All that just evolved as the business grew.

"The only thing we could do was tell the customers everything known to man, and we were getting calls from legitimate customers, from people who wanted to use them in the state pen, and from people wanting to use them for things that they should have been put in the pen for," he adds.

Roach would go down to the factory on Saturdays to help assemble computers. But no real assembly line yet existed. Each computer was crafted by hand, and output was only one a day. It wasn't until March 1978 when the manufacturing staff had grown to 385 and the space taken up by computer operations had grown from 15,000 square feet to 85,000 that the company felt it had the situation under control.

Wives and the IRS

Today different people can find different, perfectly obvious reasons for the success that no one could have predicted before it happened. (Even Leininger's guess that they would sell 50,000 TRS-80s was short by nearly 5,000 for the first year.)

"We caught the imagination of a lot of people," says Juge. "[They] realized here was a way they could gain the same kind of management advantage in their little part of the world that others had had in big business for years."

In 1979 Juge conducted a survey at the first of a series of barnstorming exhibits in 50 U.S. cities to show off the TRS-80. Seventy percent of the TRS-80 buyers claimed they were getting the computers for business.

"I guess that's what they told their wives and the IRS," Juge says now. "I think most of them just found it fascinating to use a computer. If they could figure it out and use it at work, then they wrote it off."

Schroeder explains, "It was something you could slide by the wife. You could get an 8K machine for $599. Then buy the Level II Basic for 500 bucks. Then you told the wife that you needed one disk drive. Then maybe another. The entry-level price was low, but you could spend $4,000 over a period of two years."

Roy Soltoff, who would later join Schroeder to write software for the TRS-80, saw other factors that continued to make the TRS-80 successful even after the Apple II became serious competition.

"The Apple all-in-one box didn't appeal to the purist. And it had an inferior ROM for math. It couldn't do floating point unless you got the Apple Basic language card," he says.

As important as the hardware itself in the success of the computer was the ready-made distribution system through the thousands of Radio Shack outlets. They were more common than McDonald's, and they were located in areas where the California-oriented Apple had yet to penetrate.

"Radio Shack had a better route to the people," says Schroeder. "They had better dissemination of advertising material, better distribution, and a better repair and parts network."

Trashing the TRS

No one claims the TRS-80 succeeded because it was perfect. In fact, even the most loyal TRS-80 owners called it "Trash-80," a nickname earned by the computer's inadequacies and frequent glitches.

Looking back, Roach considers the failure to plan ahead so Tandy could supply peripherals to be the biggest mistake the company made.

"It hurt us at a critical growth period," he says.

To save the 97 cents that it would have cost to add some more memory to the TRS-80's video display, Tandy left out lowercase characters. To get them, owners had to spend an extra $30 to buy an adapter kit.

There were other problems. The machine sometimes overheated, and matching the Expansion Interface to the CPU was often touch-and-go. But the biggest problems owners encountered were not in hardware but software.

Raiders of the Lost Disk

At one point Roach considered going with CP/M, the operating system created by Digital Research. It was becoming the de facto standard on S-100 computers, machines that traced their origins more directly to the Altair and used the same Z80 found in the TRS-80.

"But CP/M was an abortion," says Juge. "If you were a computer engineer, CP/M was just a set of input/output routines. It didn't do anything to save you from your own mistakes. The manuals were virtually unreadable. I had programmed for three or four years, and I have more knowledge than most customers, and I couldn't understand page 1."

Still, the company bought the rights to CP/M as a backup in case something happened with the operating system it was developing in house. And Roach warned a couple of times that if Tandy's own product hadn't reached a certain point by a certain date, he would go with CP/M.

Leininger's original operating system was never designed to be more than a temporary package to get the computer off the drawing board. But the first full-fledged operating system, TRSDOS, wasn't much better. Part of the reason behind the inadequacies of TRSDOS was the arrangement between Tandy and the person under contract to write TRSDOS, Randy Cook. Pennington describes Cook as a "bright but wary programmer who figured Radio Shack was out to screw him."

At the time Cook was writing TRSDOS in 1977, Charles Tandy died, and the company was being run by committee, Pennington says. The company kept changing what it wanted from Cook, and the programmer, to protect himself, kept making changes in the operating system that only he knew about, Pennington says. The result was a TRS-80 user's nightmare.

"It was a terrible time," Pennington says of the year he used TRSDOS. "It was dreadful trying to do a backup with one drive. The backup and format software had terrible bugs in them."

In the meanwhile others began writing alternative operating systems. Pennington saw a demo of one of these non-Tandy programs and was amazed.

"It didn't crash!" he says.

But Pennington found that he couldn't buy a copy of that program, APR-DOS, at his local Radio Shack. It wasn't an authorized Radio Shack product. Eventually, however, Pennington got a bootleg copy of Newdos, another alternative operating system.

The operating system was handed over

to Schroeder and Soltoff, who had written the unauthorized Newdos. The two Milwaukee computer enthusiasts had been quick to recognize the possibilities of the new computer and formed a software company called Logical Systems. Cook and Radio Shack bickered about the ownership of the TRSDOS code, and when it came time to write an operating system for the new Model II, the company took all copies of the source code away from the programmers. To avoid any further disputes with Cook, Radio Shack wanted to force the programmers to write a new operating system from scratch.

Today Juge admits there were flaws in the early attempts to convert Leininger's original operating system designed for use with a cassette recorder to one for use with disk drives.

"It was admittedly a buggy version," he says. "We told people this version is really not ready for consumption yet. But the people would say, 'Tell us where the bugs are, and we'll try to work around them.' "

A Hard Line on Software

Being a dreamer was almost a requirement for the early TRS-80 buyers. By the time the machine was introduced, Chandler had come up with only four programs for it. One program was for budget management. Another was a payroll program. The other two were hardly something you could use to convince the IRS you had bought the computer for business purposes: a blackjack game and a program to calculate your biorhythms.

"We got into some applications programs, but Roach didn't want to be in the software business," Juge says.

Roach says, "I didn't think software was an issue. We weren't terribly cognizant of what people wanted in software. We expected them to write their own."

But at the same time Tandy shied away from getting into the software business, it refused to help others who did want to write programs for the TRS-80.

The Apple II was introduced with what was called "open architecture." True to the thinking of the Homebrew Computer Club, Wozniak and his partner, Stephen Jobs, made no secret of how their computer worked. Third-party software companies sprang up and made fortunes writing programs for the Apple. The availability of so many programs, in turn, made the Apple II a more attractive machine. One of the programs written for it was Visicalc, the first electronic spreadsheet and the program that some have said changed the microcomputer from a luxury item to a business necessity.

Today Roach admits, "I wish Visicalc had been written for the TRS-80 instead of the Apple."

But at the time, Tandy, halfway across the continent from the hacker ethic of Homebrew, took the more conventional big-company view that information about its products was proprietary. Radio Shack was the store that didn't even sell flashlight batteries unless they had a house label on them.

"If someone at an Orange County user group wanted a copy of the source code for something that had, say, a Microsoft copyright on it, at the next user-group meeting someone in a sweat shirt and blue jeans would pass out copies of it," says Juge. "We had a little bit different way of looking at the world."

Pennington contends: "Charles Tandy had wanted an open system for the TRS-80, but when Tandy died, the committee took over. And it said, 'If we keep control of it and don't tell how it works, they'll have to buy it all from us, and we'll control the world.' "

Although Radio Shack turned to Logical Systems to write the operating systems that became LDOS and TRSDOS 6, Soltoff subsequently was frustrated trying to sell TRS-80 programs he and Schroeder wrote independently of Tandy.

At first Logical Systems was able to sell TRS-80 programs through independent retailers. But that market dried up as the retailers found it too difficult to compete with the ubiquitous Radio Shacks and easier to specialize in software for the Apple and Commodore, Soltoff says.

Logical Systems turned to mail-order ads in magazines, but that was less than successful for the same reason: Radio Shack didn't carry the magazines, severely limiting their circulation.

"Tandy has done a number of wrong things over the years, but if they had changed their position on this one point, things might be a lot different today," Soltoff says.

Later, when IBM was to enter the microcomputer field, that same proprietary attitude and pride in the Radio Shack label was to help topple Tandy from the position it shared with Apple at the top of the new industry Tandy had been instrumental in bringing to full bloom.

Boom Times

The introduction of the IBM PC, though, was still four years away, and once Tandy caught up with the back orders for the TRS-80, Tandy went on a product binge, milking the newly discovered opportunity with upgrades to the TRS-80 and with entirely new computers.

In May 1979, Tandy introduced the Model II, which added larger-capacity, 8-inch disk drives and a faster Z80A microprocessor. It also corrected some of the more frequent complaints about the Model I (as it was now called): the difficulty of matching the CPU with the interface unit and its tendency to reboot when you least expected it.

The Model III, unveiled in July 1980, was inspired by new FCC regulations on radio-frequency emission, a standard the Model I flunked. With the Model III, Tandy made a radical departure from previous models. It combined the keyboard, CPU,

"One of the more serious drawbacks of the II is its inability to accept a cassette input." **Wayne Green**, *80 Remarks*, 80 Microcomputing, *August 1982, p. 8.*

WAYNE GREEN, Magazine Publisher

Hobbyists making things for other hobbyists was the social force that fueled the early progress of personal computers, and Wayne Green was the hobbyists' Pied Piper. The controversial New Hampshire native with the genius IQ was one of the first entrepreneurs to spot the public's hunger for practical information about technology. Working from that premise, Green started computer magazines that remain influential today.

A lifelong hobbyist with a background as a Navy radio technician, Green started his first magazine, *Amateur Radio Frontiers*, in 1951; *73* magazine for ham radio enthusiasts followed in 1961. In 1976, he founded *Kilobaud Microcomputing*. When the Model I was introduced in 1977, Green thought Tandy's support efforts were inadequate to meet the informational needs of a growing base of users. To fill the void, he started *80 Micro* in January 1980.

By 1983, Green had added system-specific magazines targeted at Commodore, Apple, and Color Computer users when he sold his publishing company to International Data Group (IDG), and launched his current company, Wayne Green Enterprises, which operates as an independent subsidiary of IDG. Green publishes *Digital Audio* and several other publications covering the growing compact-disc industry, along with *73*.

Green, now 65, lives with his wife, Sherry Smythe-Green, in an 18th-century home in Peterborough, NH, that they share with their greyhound. The house is filled with books and electronics equipment. Green said he enjoys cooking, listening to some of his 600 compact discs, and reading the 300 magazines and newspapers he gets every month. (He's a speed-reader.) Working on new ideas remains perhaps his greatest passion. He is currently negotiating with Chinese leaders to develop a technical education program for 10–17-year-olds based around a monthly magazine.

Green feels Tandy could have become the number one personal computer maker if it hadn't "made it miserable for third-party developers." IBM learned from Tandy's mistakes, cooperated with other companies that supported its PC, and grabbed the dominant position that it holds today. "You have to give Tandy a plaque for showing IBM how to do it," Green said. ■

TANDY Trivia

Companies Advertising in the First Issue of *80 Micro* (January 1980) and Still in Business

Apparat
Compupro (now Viasyn)
Contract Services Association
Electronic Specialists Inc. (ESP)
H & E Computronics
Howe Software
Micro Systems Software
Miller Microcomputer Services
NRI Schools/McGraw-Hill
Tandy/Radio Shack

TRS-80 DOSes We Have Known

CP/M 2.2
CP/M 3.0
DBLDOS
Dosplus 3.4, 3.5, 4.0
LDOS 5.1, 5.2, 5.3
LS-DOS 6.3
Multidos
Newdos
Newdos/80 2.0
POS
Rapidos
TRSDOS 1.2, 1.3, 2.3, 2.0, 6.0, 6.2
Ultrados
VTOS
XDOS

Short-Lived Phenomena

Electric Crayon and Chromatrs: Color for the Model I, but no software to take advantage of it.

Excalibur: A Model III/4 add-on to run MS-DOS software.

MC-10: Everything the Timex/Sinclair was and less, for three times the price.

Tandyvision: Tandy's answer to Atari's game machines.

Tandy 10: Tandy's first "big" business computer, but the biggest thing about it was its $9,950 price tag.

TDP-100: Tandy's attempt to market the Color Computer in non-Radio Shack stores.

"Even if we had President Reagan in our ads, we wouldn't sell any more computers." Tandy Vice President of Marketing **David Beckerman**, *Pulse Train,* 80 Micro, *October 1983, p. 300.*

interface, monitor, and disk drives all in one cabinet. Except for a new reset button, inside the cabinet were the guts of a Model I, but the computer had become less of a hobbyist's collection of individual parts and more a plug-and-run tool for the office and school. (The schools particularly liked the all-in-one design because it was harder for a student to walk off with than a disk drive or cassette recorder in his or her book satchel.)

Introduced at the same time as the Model III, the Color Computer was Tandy's answer to the popularity of the Commodore Vic-20 as an inexpensive computer for home use. In March 1984, Tandy created the first successful laptop computer with the introduction of the Model 100. It was a battery-driven computer that fit inside a briefcase and that came complete with built-in word processing, Basic, and the software and hardware necessary to hook the computer to a phone. The 100 became an instant necessity for reporters and executives who spent a lot of time on airplanes.

The Model 4 in April 1983 retained the Model III's cabinet but upgraded it to a faster CPU and an 80-column by 24-line screen. It also included the TRSDOS 6 operating system, which finally answered most of the owners' complaints.

By 1979 Tandy had sold more than 200,000 computer systems, topping $500 million in sales. The company was shipping hundreds more each day. There were more than 1,600 employees in six factories turning out TRS-80s alone. Computers and the seemingly never-ending list of accessories were quickly becoming Tandy's biggest single source of revenue, growing from 8.5 percent of the company's income in 1979 to 34.5 percent in 1983.

During much of that time Tandy continued to run a nip-and-tuck race with Apple for the leading share of the market. In 1979, both companies had about 20 to 40 percent of the market, depending on whether you defined the market as home computers, business computers, or both. (One estimate for Tandy's share at its peak was 60 percent.) But after that year, Tandy's share of the market began to slip.

The decline in its market share was at first partially attributable to the fact that Tandy has never measured its success by market share. While other computer companies were cutting prices, Tandy refused to do anything that would cut into its profit margin. The strategy worked. Tandy's profits, even while its share of the market was eroding, continued to grow at the rate of 35 percent a year. But more and more the market wasn't the same game in which Tandy was used to playing a dominant role. A new player had entered the game, and it had the clout to change the rules. The player was IBM.

The Big Blues

No one today will argue that the IBM PC introduced in 1981 was a radical advance in computer technology. IBM played it safe, using proven components that were in abundant supply. The most significant difference was that it used a 16-bit CPU, the Intel 8088. The 8088 meant that programmers could use up to 640K of memory for their programs. The 8-bit CPUs in Tandy computers and all other computers until the IBM machine came along were limited to 64K.

Just as importantly, the new 16-bit machines had the IBM logo on them. For a price not that significantly different from that for a TRS-80 or an Apple II, you could have on your desk or in your bedroom a computer made by the world's biggest computer company. Executives, many of whom still considered the Apple something for kids to play games on and the TRS-80 something for hobbyists to tinker with, suddenly became a whole new market for computer sales. But the only one selling to them was IBM.

Today people at Tandy don't like to admit it, but others are quick to say that Tandy was too proud to recognize the threat posed by IBM.

"The thing is that our market share declined precipitously," Juge says of the first couple of years after IBM brought out its personal computer. "They caught us off guard. No one thought [IBM's impact] would be as drastic as it was."

By 1983, profit margin or no profit margin, Tandy's share of the market was about half what it had been at its peak in 1979. More importantly, its profits, which had been on a steady climb for four years, were fast leveling off.

Roach denies that there was any debate within Tandy as to whether they should jump on the IBM bandwagon, which was already loaded down with a hoard of established and new computer companies.

"Our long experience in the marketplace told us there were standards that evolved that need to be followed. In the 16-bit world, MS-DOS was the standard," Roach says.

But it wasn't until two years after the debut of the IBM PC, when Tandy finally brought out its first MS-DOS computer, that the Texans gave any indication they knew those standards existed.

"Our timing might have been affected by the overall size of the business we were generating with the 8-bit machines," Roach says. "These machines continued to sell well despite the PC. There was no great urgency to create an MS-DOS machine."

Roach may deny there was any Texan pride behind the slowness to make a concession to the standard being forced on the microcomputer game by this high-rolling newcomer from back East. But Tandy's response to that standard, introduced in November 1983, still exhibited a stubborn streak. The Tandy 2000 was an MS-DOS, 16-bit computer all right, but it was compatible with the IBM PC only in the loosest definition of the word.

Not that the Tandy 2000 wasn't a good

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"We never built a home computer until the Color Computer." Tandy's **Ed Juge**, *80 News*, 80 Microcomputing, *June 1981, p. 58.*

Defunct Tandy-Specific Magazines

I/III/4 •
80 U.S./Basic Computing
The Alternate Source
Color Computer Magazine
Color Computer News
Color Micro Journal
Computer User
Eighty System Newsletter
H & E Computronics Magazine
HOT CoCo
PC Companion
Pocket Computer Newsletter
TRS-80 Microcomputer News
Two/Sixteen Magazine
Undercolor

• Sent out promotional material, but was never actually published.

Tandy-Specific Magazines Still Publishing

80 Micro
Misosys Quarterly
Northern Bytes
One-Thousand Magazine
PCM
Portable 100
Rainbow

The TRS-80 Clone Graveyard

Dick Smith System 80 (Australia)
Dragon by Tano (Color Computer)
LNW-80
Lobo Max-80
Phoenix
PMC-80
Video Genie (England)
TRZ-80 (Australia)

When the TRS-80 Was King

The November 1982 issue of *80 Micro* had almost 360 advertisers and nearly 250 pages of ads. It also contained 54 articles, 19 columns and departments, and 14 reviews.

" 'If I gave one of these to my wife for Christmas, she'd think I was some sort of nut,' he [then Tandy President Lew Kornfeld] said, clutching a prototype of the original Model I. Worded that way, the project didn't seem to make much sense." Model I manual author **David A. Lien**, *"A Look Back,"* 80 Micro, *Anniversary Issue 1983, p. 12.*

computer. Even an experienced Tandy critic like Harvard Pennington was impressed by it.

"Technologically, engineering-wise, it was well-designed. It was faster. The way you took boards in and out—they slide on little trays—was slick. The Tandy 2000 even had a little bit of style in how it looked," Pennington says.

The 2000's Intel 80186 CPU was, in fact, two to four times as fast as the 8088 used in the IBM machine. And Tandy used drives that stored more information on a floppy disk than IBM's drives. Graphics, which had been one of the most criticized features of the IBM, were given more resolution on the 2000. Tandy even threw in a couple of extra function keys. Many who looked at the 2000 saw a better machine than the IBM PC. In a very real way, it was *too* good.

The Advantage of Mediocrity

When the IBM PC was introduced, computer programmers, being born hackers, quickly learned how to play tricks with the MS-DOS operating system, which they considered slow and cumbersome. The programmers figured out how to go around the operating system, which was designed to be a mediator between software and hardware, so that their programs could give instructions directly to the various hardware components. It was faster and, from the hacker's standpoint, a more efficient way of doing things.

The problem with the Tandy 2000 was that if any of these programmer's tricks tried to send instructions directly to the disk drives, CPU, or monitor, chances are the tricks wouldn't work with the "improved" features. Tandy ran tests on its new MS-DOS computer of 100 of the more popular programs for the IBM PC. Half of them wouldn't work. One of those was Lotus's 1-2-3, which had justified purchase orders for IBM personal computers the same way Visicalc had legitimized the Apple II.

The programmers at Lotus ran tests on both the Tandy 2000 and the IBM PC. The 2000 finished in half the time the IBM took. The Lotus people told Juge "it was the neatest computer they had got their hands on." They agreed to modify 1-2-3 for it, a job that took only four hours, Juge says.

But Lotus was just one software company, and an enormous advantage of having an IBM PC or a highly compatible clone was the wealth of software available under the IBM standard. There were too many software companies confronted by too many semi-compatible computers like the Tandy 2000 for all the programmers to keep up with what all the hardware engineers were doing. Like it or not, the minimum requirement for survival in the age of the IBM PC was to conform religiously to the IBM standards.

Other computer manufacturers—DEC, Texas Instruments, and Eagle—had already made the mistake of creating "improved" PCs, but Juge says that Tandy hadn't noticed that few people were buying the semi-clones.

"The reason we did what we did was that we didn't like the idea of just going out and copying what someone else was doing. It was not our thing," he says. "We knew we could either clone this computer or we could build the best damn MS-DOS machine our engineers could design—the state of the art in hardware."

The spirit of jingoism was running so high at Tandy that Juge decided against suggesting they also build a clone "just in case."

"I had nagging doubts [about the 2000], but not enough to argue with anybody."

Leininger, who after his Model I burnout had left Tandy for a while and then come back, says he did tell his bosses the plans for the 2000 were wrong. But they didn't listen to him.

"Tandy was under the assumption that there were going to be three standards for microcomputers: Apple, IBM, and Tandy," he says. "I don't know what they were thinking. The sun gets awfully hot out here. Maybe it baked their brains."

The Standardization Game

Within six months of its introduction, no one had to tell Tandy the 2000 wasn't going to fly, Juge says. "We knew we had made a mistake."

A suspicion that they might have made a mistake may have begun to surface at Tandy even before then. The Tandy 2000 was introduced at the Consumer Electronics Show in Las Vegas on Nov. 30, 1983. Two months earlier John Roach had stood before a blackboard filled with specs for a new computer, one that was to be more closely compatible with the IBM PC.

"Gentlemen," Roach told the engineers in the conference room as they studied the blackboard, "this is our next product. It is code-named August. I hope it's obvious what that means."

The plans were for the Tandy 1000, envisioned as a computer that would offer more functional compatibility with the IBM PC, but would still have hardware improvements. It would require fewer expansion boards by making a lot of the expansion board circuitry standard on the 1000's motherboard. It would take up less space on a desktop, and despite the problems caused by the "improved" keyboard, speed, and graphics on the 2000, it was being designed with 12 function keys, would run faster than the IBM, and have a higher-resolution graphics display. This time, though, the graphics would conform to a different IBM standard, that of the PCjr.

While the 1000 was being readied for market, Tandy decided to take a second look at another computer design the company had rejected earlier. Jugi Tandon, head of one of the major manufacturers of disk drives for microcomputers, had earlier pitched Tandy on a 100 percent IBM clone his company planned to make. He wanted

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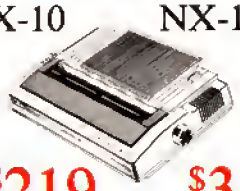

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80 col.

$339
136 col.

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- Friction and push tractor
- 5K buffer
- Parallel interface
- IBM graphics
- Single sheet auto-feed

ND-10 ND-15

$349
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$449
136 col.

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- Friction and push tractor
- 12.6K buffer
- Parallel interface
- IBM graphics
- Single sheet auto-feed

NR-15

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- 12.6K buffer
- Parallel interface
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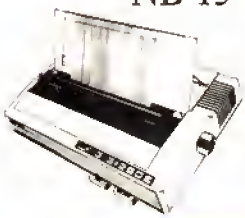

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"The simple fact is that the Model I/III's halcyon years are over. They ended on Nov. 30, 1983, the day Tandy announced the Model 2000."
Eric Maloney, *Side Tracks*, 80 Micro, *March 1984, p. 10.*

to know if Radio Shack would be interested in selling it under the Tandy label.

"At the time, it wasn't what we were interested in doing," says Juge, "but when Tandon came back to John [Roach] later on and said it was ready to go, we said, 'Why not?' People had been asking us to bid on large-quantity sales, and they were specing the PC/XT."

Released in November 1984, the pure clone—the Tandy 1200—was not a success story, Juge says. The 1000, which was released a couple of months before the 1200, on the other hand, has been one of Tandy's best-selling MS-DOS computers.

Since then Tandy has followed a policy of developing IBM compatibles that include a little something extra: extra speed, an extra expansion slot, an extra connection for a joystick or light pen.

Bouncing Back

The strategy seems to be paying off. The installed base of Tandy computers of all types has grown from 1,045,000 in 1982—the year before its first MS-DOS machine—to 3,180,100 in 1986, according to International Data Corp., a market-research firm. Radio Shack stores sold 68,000 MS-DOS computers in the first quarter of this year, 62 percent more than the same quarter last year, IDC says. Another research firm, Infocorp, notes that last year Tandy sold 667,500 computers—not all of them MS-DOS machines—putting it in a tie once again with Apple, each claiming 25 percent of the microcomputer market. The difference now is that the two companies are tied for second behind IBM.

What's more important to Tandy in the long run is that it no longer pretends it can ignore the presence of IBM. In 1986 it began emulating another well-known IBM standard: the well-dressed salesperson. After inspecting several Radio Shack stores and coming away in a state of shock from some of the grungy furnishings and grungier sales staff, Roach issued a directive establishing the company's first dress code. Roach also began a store-by-store refurbishing designed to vanquish once and for all the Radio Shack image as a hobbyist's haven. He replaced it with a new image as "the technology store," specifically technology catering to businesses. He also began a program of more training for computer sales personnel and established an outside sales force to reach the business executives.

And Tandy is no longer shy about IBM technology. Although he refuses to be specific, Roach says that it will match IBM's move earlier this year in creating a computer based on the powerful Intel 80386 CPU.

(The people at Tandy take some satisfaction from the fact that IBM's new line of Personal System/2 computers has a 12-function-key keyboard and a new type of expansion slot that resemble those on the hapless Tandy 2000 more than they resemble those on the IBM PC.)

Roach welcomes the changes in the IBM products because their new disk drives, analog video, and "microchannel" bus introduce hardware incompatibilities with IBM's own older PCs. The changes free Tandy from what rankled the company in the first place, a slavish adherence to IBM hardware.

"OS/2 [the new operating system under development by Microsoft for the 80386 computers] is hardware independent," Roach says. "Windows is hardware independent. What you're really saying is that from a hardware standpoint, the manufacturers are going to have the opportunity to provide different features, different performance—if they will run the same software."

Roach also hints that Tandy has an MS-DOS laptop in the works, another area in which Tandy has lost its lead to MS-DOS computers, in this case the high-power portables from Japan.

On the other hand, the Model 4, at one time Radio Shack's biggest-selling computer, is doomed.

"We'll sell the TRS 8-bit machine as long as there's a continuing demand for it," Roach says. But he adds: "Certainly its popularity and volume is continually declining."

He has better hopes for the continued success of the Color Computer line as a home computer, although he refuses to call it a home computer.

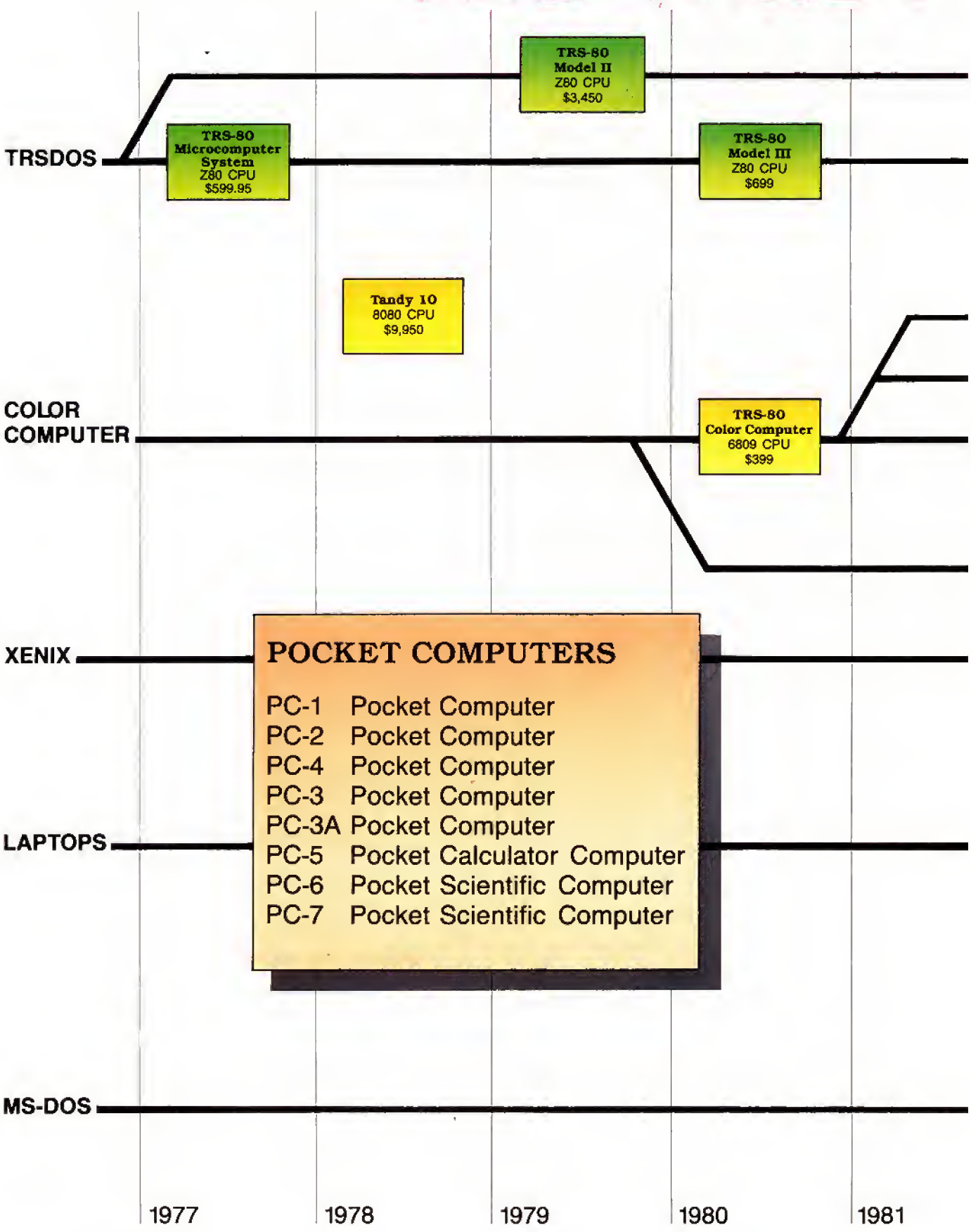
"One of these days, the industry will develop a true home computer. It's something our people are working on," he says without elaborating.

Overall, there is a sense of direction, a sense of organization at Tandy now that didn't exist 10 years ago when Roach noticed his engineers tinkering with the first microcomputers. The way Roach talks, Tandy won't be caught again either napping or sticking its head in the sand:

"Our goal now is selling all technology products that have a broad customer base—and in many cases being on the leading edge of those products, such as we're doing developing the cellular phone market, which is really not a market yet. That's not something we've always done with microcomputers. But that's not a mistake we'll make again."■

Ron White is a newspaper editor, writes for several computer magazines, and is co-chairman of the IBM-Compatibles User Group. Write to him at 116 E. French, San Antonio, TX 78212.

THE TANDY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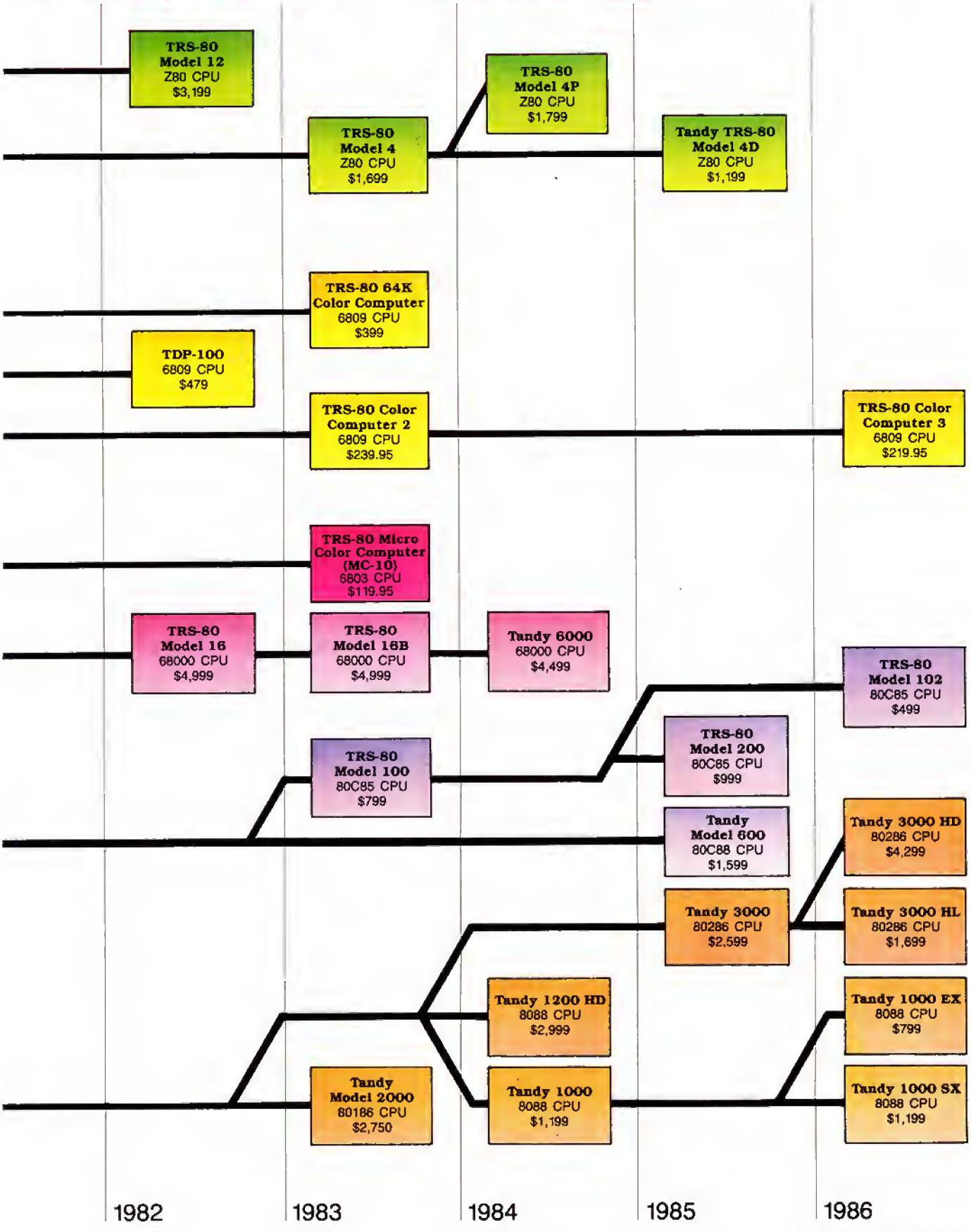

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I used to make a temporary test-data program to create dummy data files for my programs to read. However, I always had to write each test-data program from scratch. I also had trouble keeping the test-data program and the program it was created for in synchronization. Any change in the program under development required a corresponding change in the test-data program.

The Right Questions

Fakeout (see Program Listing 1) is the end result of my efforts to make sequential file programming tasks on the Model 4 easier (modifications for the Tandy 1000 and 2000 appear below). Fakeout is set up to ask for information that as a programmer you should be asking yourself. Fakeout asks how many variables will I use? Will the program handle strings or values? Are the values integers, single precision, or double precision? How many levels are in each array?

If you are not using arrays in Fakeout, use level 1. The first-level questions refer to the dimension of the array, and the second-level questions refer to elements in the array. If you want to work with several (e.g., 10) "records," answer the first-level question with 1 and the second level with 10. Ten dummy variables will then be in the array.

Fakeout then systematically creates a program that generates dummy test data to use with the program you are developing. In writing Fakeout, I discovered

System Requirements

Model 4
(Tandy 1000/2000 with changes)
Basic
Available on The Disk Series

Program Listing 1. Fakeout. See p. 100 for information on using checksums in Listings 1 and 2.

```
10000 'FAKEOUT/BAS   Mod 4   by D.Kuzminski
10010 CLEAR:DEFSTR A-H:DEFINT I-N:DIM B(26), BQ(26), SV(26), LAY
    (26), QNT(26,4)                                          '*  4577
10020 'assign definitions
10030 FOR L=65 TO 90:HM=HM+CHR$(L)+CHR$(L+32):NEXT           '*  2967
10040 LD(0)=9:LD(1)=4:LD(2)=9                                '*  1564
10050 CLS:FOA(1)="WRITE":FOA(2)="PRINT":FOA(3)=FOA(2):FOA(4)=FOA
    (2)                                                      '*  3980
10060 FIA(1)="LINE INPUT":FIA(2)="INPUT":FIA(3)=FIA(2):FIA(4)=FI
    A(2)                                                     '*  3997
10070 DISS(1)="String":DISS(2)="Integer":DISS(3)="Single":DISS(4
    )="Double"                                               '*  5286
10080 DS(1)="$":DS(2)="%":DS(3)="!":DS(4)="#":FLAG1="xxxx"   '*  3240
10090 'determine how many variables
10100 INPUT "How many variables";VAR:IF VAR>26 OR VAR<1 THEN 101
    00                                                       '*  4630
10110 'start loop for user assignments
10120 FOR I=1 TO VAR:PRINT "Variable" I                      '*  2648
10130 GOSUB 10150:NEXT:GOTO 10350                            '*  1969
10140 'get variable name
10150 INPUT "Variable name";B(I):IF LEN(B)>39 THEN 10150 ELSE IF
    B(I)="" THEN READ B(I)                                   '*  5488
10160 'validate variable name
10170 GOSUB 11670:IF FLAG="on" THEN 10150                    '*  2431
10180 'validate non-duplicate variable name
10190 GOSUB 11600:IF FLAG2="1" THEN 10150                    '*  2288
10200 PRINT "Variable has been designated as " B(I)          '*  3976
10210 IF FLAG="skip" THEN 10250                              '*  1916
10220 'determine variable type
10230 PRINT "Is " B(I) " to be a 1) string, 2) integer, 3) singl
    e-precision, or 4) double-precision variable?"           '*  8634
10240 GOSUB 11430:SV(I)=INSTR("1234",H)                      '*  2253
10250 IF SV(I)=0 THEN 10240 ELSE MID$(FLAG1,SV(I),1)=RIGHT$(STR$
    (SV(I)),1)                                               '*  4330
10260 GOSUB 11640                                            '*   949
10270 'determine dimension of variable
10280 PRINT "How many layers in " B(I) "?"                   '*  2933
10290 GOSUB 11430:LAY(I)=INSTR("1234",H):IF LAY(I)=0 THEN 10290  '*  3664
10300 FOR J=1 TO LAY(I)                                      '*  1334
10310 PRINT "How many in layer" J "?"                        '*  2634
10320 INPUT QNT(I,J):IF QNT(I,J)=0 THEN 10320                '*  2695
10330 NEXT:RETURN                                            '*  1136
10340 'display definitions
10350 A="\                                \ \     \ ####
    /####/####/####"                                         '*  3048
10360 'display variables
10370 X=1:Y=10:IF Y>VAR THEN Y=VAR                           '*  2153
10380 FOR I=X TO Y                                           '*  1085
10390 PRINT USING A; B(I); DISS(SV(I)); QNT(I,1); QNT(I,2); QNT(
    I,3); QNT(I,4)                                           '*  4644
10400 NEXT:GOSUB 11450:IF I>VAR THEN 10440                   '*  2538
10410 IF Y<VAR THEN X=X+10:Y=Y+10:IF Y>VAR THEN Y=VAR        '*  3383
10420 GOTO 10380                                             '*   876
10430 'user validation
10440 PRINT:PRINT "Were they all okay?"                      '*  2986
10450 GOSUB 11430:IF H="N" OR H="n" THEN 10460 ELSE 10500    '*  3220
10460 FOR I=1 TO VAR                                         '*  1189
10470 PRINT "Edit " B(I) "?";:GOSUB 11430:IF H="Y" OR H="y" THEN
    GOSUB 10150                                              '*  4500
10480 NEXT:GOTO 10440                                        '*  1256
10490 'determine ASCII program name for merging
10500 INPUT "Name of test program and drive destination (FILENAM
    E:D)";D:GOSUB 11490:IF FLAG2="on" THEN 10500             '*  8007
10510 'determine destination of test data
10520 INPUT "Test file destination drive number";TDEST:IF TDEST<
    0 OR TDEST>3 THEN 10520                                  '*  6630
10530 'prepare variable subscripts
10540 FOR J=1 TO VAR:GOSUB 11110:NEXT                        '*  2284
10550 'prepare DIM statement
10560 GOSUB 11150                                            '*   948
10570 'start writing ASCII program lines to file
10580 OPEN "O", 1, D                                         '*  1040
10590 PRINT#1, "10 '"+D+" Mod 4 "+DATE$                      '*  2103
10600 PRINT#1, "100 CLEAR:DEFINT I-N"                        '*  2168
10610 PRINT#1, "150 DIM "+DLST$                              '*  1744
10620 'write FLAG set for logic control
10630 PRINT#1, "200 KUZ=0"                                   '*  1444
10640 'write error control 1
```

Listing 1 continued

Listing 1 continued

```
10650 PRINT#1, "990 CLS:ON ERROR GOTO 5010"                              '*  2545
10660 'write file input routine
10670 PRINT#1, "1000 OPEN "+CHR$(34)+"I"+CHR$(34)+", 1, "+CHR$(3
      4)+"testseq"                                                       '*  4310
10680 C="1000 ":FOR J=1 TO VAR:GOSUB 11220:GOSUB 11240                   '*  3115
10690 PRINT#1, C+FO                                                      '*  1104
10700 NEXT                                                               '*   599
10710 PRINT#1, "1050 CLOSE 1"                                            '*  1591
10720 'write file display routine
10730 C="1100 ":FOR J=1 TO VAR:GOSUB 11220:GOSUB 11280:GOSUB 113
      80:GOSUB 11360                                                     '*  4568
10740 PRINT#1, C+FO                                                      '*  1100
10750 NEXT                                                               '*   604
10760 'write FLAG check to prevent endless loop program
10770 PRINT#1, "1200 IF KUZ=1 THEN STOP"                                 '*  2367
10780 'write dummy data creation routine
10790 C="2000 ":FOR J=1 TO VAR:GOSUB 11220:GOSUB 11280:GOSUB 114
      80:GOSUB 11360                                                     '*  4567
10800 PRINT#1, C+FO                                                      '*  1097
10810 NEXT                                                               '*   601
10820 'write FLAG reset for logic control
10830 PRINT#1, "2100 KUZ=1"                                              '*  1496
10840 'write error control 2
10850 PRINT#1, "2990 ON ERROR GOTO 5020"                                 '*  2314
10860 'write file output routine
10870 PRINT#1, "3000 OPEN "+CHR$(34)+"O"+CHR$(34)+", 1, "+CHR$(3
      4)+"testseq:"+RIGHT$(STR$(TDEST),1)                                '*  5767
10880 C="3000 ":FOR J=1 TO VAR:GOSUB 11220:GOSUB 11280:GOSUB 113
      40:GOSUB 11360                                                     '*  4571
10890 PRINT#1, C+FO                                                      '*  1106
10900 NEXT                                                               '*   601
10910 PRINT#1, "3050 CLOSE 1"                                            '*  1595
10920 'write message display
10930 PRINT#1, "3060 PRINT "+CHR$(34)+"Testfile written!"+CHR$(3
      4)                                                                 '*  4329
10940 'write routine to re-route program to input and display du
      mmy file just created
10950 PRINT#1, "3070 GOSUB 4010:GOTO 990"                                '*  2324
10960 PRINT#1, "4000 END"                                                '*  1356
10970 'write timer routine
10980 PRINT#1, "4010 FOR TM=1 TO 500:NEXT:RETURN"                        '*  2969
10990 'write error control routines
11000 PRINT#1, "5010 CLOSE 1:RESUME 2001"                                '*  2334
11010 PRINT#1, "5020 RESUME 3050"                                        '*  1828
11020 'write display source code routine
11030 PRINT#1, "7000 LIST -8000"                                         '*  1726
11040 PRINT#1, "8000 END"                                                '*  1350
11050 CLOSE 1                                                            '*   734
11060 'inform user that source code is complete
11070 PRINT:PRINT "Program written!"                                     '*  2807
11080 'load newly created source code into FakeOut for user insp
      ection
11090 CHAIN MERGE D, 7000, ALL                                           '*  1706
11100 'variable subscript routine
11110 BQ(J)="(":FOR I=1 TO LAY(J)                                        '*  1863
11120 BQ(J)=BQ(J)+RIGHT$(STR$(QNT(J,I)),LEN(STR$(QNT(J,I)))-1)+"
      ,"                                                                 '*  3843
11130 NEXT:X=LEN(BQ(J)):MID$(BQ(J),X,1)=")":RETURN                       '*  3038
11140 'DIM routine
11150 DLST5="":FOR I=1 TO 4                                              '*  1556
11160 FOR J=1 TO VAR                                                     '*  1188
11170 IF INSTR(FLAG1,RIGHT$(STR$(I),1))=SV(J) THEN DLST5=DLST5+B
      (J)+BQ(J)+", "                                                     '*  4681
11180 NEXT                                                               '*   602
11190 NEXT:DLST5=LEFT$(DLST5,LEN(DLST5)-2)                               '*  2673
11200 RETURN                                                             '*   756
11210 'assign line numbers
11220 X=LEN(STR$(J)):MID$(C,6-X,X-1)=RIGHT$(STR$(J),X-1):RETURN          '*  3852
11230 'setup variables for file input
11240 FOR I=1 TO 4:SWAP FOA(I), FIA(I):NEXT                              '*  2593
11250 GOSUB 11280:GOSUB 11340:GOSUB 11360                                '*  2397
11260 FOR I=1 TO 4:SWAP FOA(I), FIA(I):NEXT:RETURN                       '*  3133
11270 'setup transitory variables
11280 FO="":G1="("                                                       '*   909
11290 FOR I=1 TO LAY(J):G(I)=CHR$(I+72):G1=G1+G(I)+","                   '*  3028
11300 'start FOR NEXT loops routine
11310 FO=FO+"FOR "+G(I)+"=1 TO"+STR$(QNT(J,I))+":"                       '*  2788
11320 NEXT:X=LEN(G1):MID$(G1,X,1)=")":RETURN                             '*  2675
11330 'concatenate PRINT/WRITE or INPUT/LINE INPUT routine
11340 FO=FO+FOA(SV(J))+"#1, "+B(J)+G1:RETURN                             '*  2538
11350 'complete FOR NEXT loops routine
11360 FOR I=1 TO LAY(J):FO=FO+":NEXT":NEXT:RETURN                        '*  3161
11370 'concatenate display PRINT routine
11380 FO=FO+"PRINT "+B(J)+G1:RETURN                                      '*  2149
11390 'setup dummy data assignment lines routine
11400 IF SV(J)=1 THEN FO=FO+B(J)+G1+"=STRING$(RND(20),RND(95)+32
      )" ELSE FO=FO+B(J)+G1+"=RND(100)"                                  '*  5587
11410 RETURN                                                             '*   759
11420 'keyboard scan
11430 H=INKEY$:IF H="" THEN 11430 ELSE RETURN                            '*  2725
11440 'timer
11450 FOR TM=1 TO 500:NEXT:RETURN                                        '*  2108
11460 'default variables
11470 DATA AA, BB, CC, DD, EE, FF, GG, HH, II, JJ, KK, LL, MM, N
      N, OO, PP, QQ, RR, SS, TT, UU, VV, WW, XX, YY, ZZ                  '*  6529
11480 'validate filename routine
11490 FLAG2="":L=0:KX=0:IF LEN(D)<1 OR LEN(D)>23 THEN 11580              '*  3417
11500 I=L+1:GOSUB 11570:IF Q<4 OR Q>55 THEN 11580 ELSE IF I=LEN(
      D) THEN 11560                                                      '*  4493
11510 FOR I=L+2 TO L+LD(KX):GOSUB 11570:IF Q<4 OR I=LEN(D) THEN
      LB=I:I=L+LD(KX)                                                    '*  4807
```

Listing 1 continued

that, by restricting the line numbers to a specific range, I could also use the newly developed test-data program as code that I could merge into the program being developed.

This way I know that I always have input/output (I/O) that will match between the test-data program and the developing program. I also put into the test-data program a DEFINT for I to N, dimensioning for the variables, a simple timer routine, and a likewise simple data-display routine. Thus, even more code is available for the new program.

Fakeout allows changes to any variables before writing the test-data program source code and also checks the test-data program file name and drive destination for Model I/III/4 file-name conventions. It asks for the drive destination of the dummy data file, as well.

Fakeout performs a merge of the test-data program to let you inspect its source code before using it to create dummy data or merging into developing program code. Because the test-data program code is merged into Fakeout, it becomes immediately available for running to make dummy data without loading the test-data program separately. All you need to do is to type RUN and press enter. Don't renumber Listing 1 because part of the created routine may overwrite the program when it merges the source code into itself.

Because you can use Fakeout on several different machines, it does not incorporate a routine to ensure that you do not use all available memory in dimensioning the arrays. This depends on your judgment. Fakeout also sets up the variables and loops with the assumption that subscript (0) cannot be used because some programmers might be able to use Option Base in their programs.

Adjustments

You can change the variables in all Data statements to your choice. You must have 26 different variables in each data set as the loops are set to 26. Because the routine for making Print# statements uses commas for Print# and Write#, if you normally use only Print#, then you might want to change the comma in line 11290 to a semicolon to use disk space more efficiently for actual test files.

Model 1000 and 2000 Modifications

If you are using the 1000 or 2000, you should delete the section in lines 11490–11580 and replace the lines given in Program Listing 2. Comments can be left out. ■

David L. Kuzminski is a microcomputer data specialist for International Business Services in Hopewell, VA, and teaches at the computer lab at Saint Leo College. Write to him at 2581 Pinehurst Drive, Petersburg, VA 23805.

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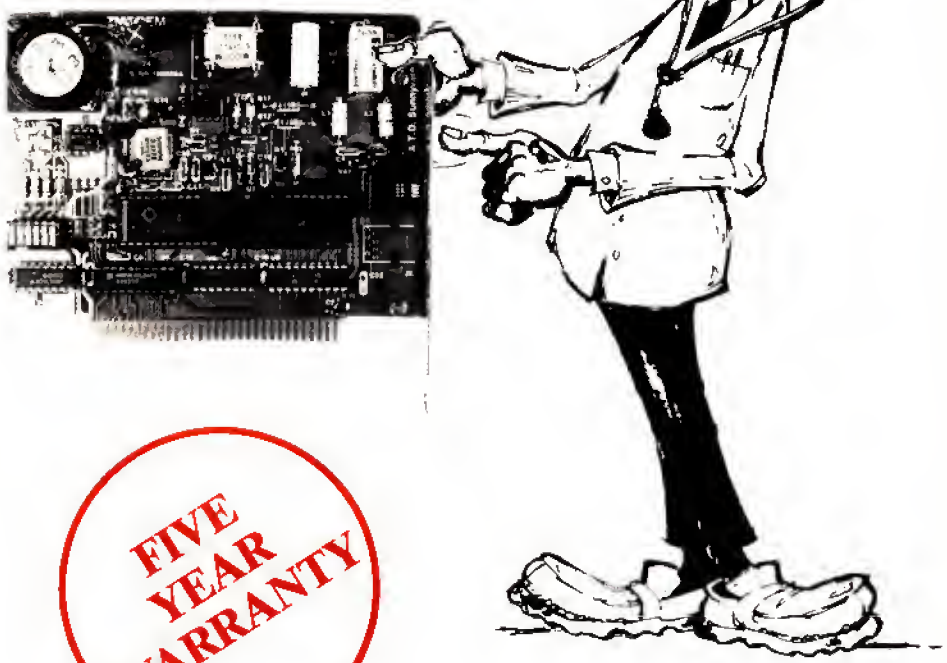

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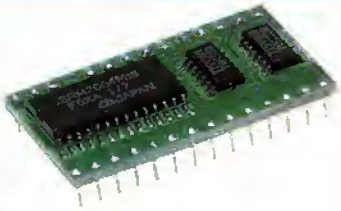

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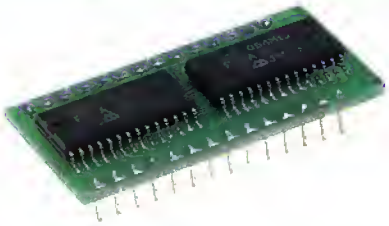

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Listing 1 continued

```
11520 NEXT:IF Q=0 OR (LB=L+LD(KX) AND Q>3) THEN 11580 ELSE IF LB
      =LEN(D) THEN 11560                                          '*  4861
11530 IF KX>=Q THEN 11580 ELSE KX=Q                               '*  2112
11540 L=LB:IF KX<3 THEN 11500                                     '*  1683
11550 I=LB+1:GOSUB 11570:IF (Q<56 OR Q>59) OR I<>LEN(D) THEN 115
      80                                                          '*  3834
11560 RETURN                                                      '*   765
11570 Q=INSTR("/.:"+HM+"0123456789",MID$(D,I,1)):RETURN           '*  3151
11580 FLAG2="on":PRINT "Invalid name!":GOTO 11450                 '*  3371
11590 'duplicate variable names routine
11600 FLAG2="":FOR J=1 TO I-1:IF FLAG="skip" THEN SKIP=0 ELSE SK
      IP=1                                                        '*  4292
11610 IF J<>I AND B(I)=LEFT$(B(J),LEN(B(J))-SKIP) THEN FLAG2="!"
      :PRINT "Invalid!"                                           '*  5003
11620 NEXT:RETURN                                                 '*  1139
11630 'assign or validate variable type routine
11640 Q1=INSTR(RIGHT$(B(I),1),DS(SV(I))):IF Q1=1 THEN RETURN      '*  3687
11650 B(I)=B(I)+DS(SV(I)):RETURN                                  '*  1922
11660 'validate variable name routine
11670 FLAG="":FOR L=1 TO LEN(B(I)):Q=INSTR("$%!#.0123456789"+HM,
      MID$(B(I),L,1)):IF Q=0 THEN FLAG="on":L=LEN(B(I)):GOTO 1171
      0                                                           '*  7215
11680 IF L<>LEN(B(I)) AND Q<5 THEN FLAG="on":L=LEN(B(I)):GOTO 11
      710                                                         '*  4025
11690 IF Q<16 AND L=1 THEN FLAG="on":L=LEN(B(I))                  '*  2887
11700 IF Q<5 THEN FLAG="skip":SV(I)=Q                             '*  2390
11710 NEXT:RETURN                                                 '*  1139
```

End

Program Listing 2. Replacement lines for Fakeout for the Tandy 1000 and 2000.

```
10000 'FAKEOUT/BAS   Mod 1000   by D.Kuzminski
10500 INPUT "Name of test program and drive destination (D:FILEN
      AME)";D                                                     '*  5750
10520 INPUT "Test file name and drive destination (D:FILENAME)";
      TDEST$                                                      '*  5519
10590 PRINT#1, "10 '"+D+" Mod 1000 "+DATE$                        '*  2244
10670 PRINT#1, "1000 OPEN "+CHR$(34)+"I"+CHR$(34)+", 1, "+CHR$(3
      4)+TDEST$                                                   '*  3889
10870 PRINT#1, "3000 OPEN "+CHR$(34)+"O"+CHR$(34)+", 1, "+CHR$(3
      4)+TDEST$                                                   '*  3899
11400 IF SV(J)=1 THEN FO=FO+B(J)+G1+"=STRING$(INT(RND*20),INT(RN
      D*100-5)+32)" ELSE FO=FO+B(J)+G1+"=INT(RND*100)"            '*  6551
```

End

Circle 90 on Reader Service card.

Communal Data Entry

Enter data on either MS-DOS or TRSDOS computers with this common data-entry routine.

Photo. MDEntry sample data input screen to input name, address, and phone number.

Setting up a data base using an IBM clone is usually not difficult, but when you have to enter 35,000 names, addresses, and other pertinent data, it becomes a problem.

The actual work of entering the data for this project was to be split up among three computers, one IBM clone and two Model 4's. I needed a program common to both types of machines, so I wrote Multipurpose Data Entry, or MDEntry (see Program Listings 1 and 2). See photo for sample data input screen. As I started to write MDEntry, I thought how often I had written almost this same program for entering data. However, to convert an old program, I would have to do a complete rewrite. What I needed was a versatile program that would let me rewrite the rewrite if I decided to enter more data.

In addition, I wanted a data-entry program that I could use with other data programs. I wanted to be able to expand it and to custom-fit it to other needs. And it had to run on both machines.

Data Statements

Using Data statements, changing the parameters of this program is easy. For example, the line below in Listing 2:

```
1330 DATA "LAST NAME",2,2,20,20
```

System Requirements

Model III/4 or Tandy 1000
Basic
Available on The Disk Series

Program Listing 1. MDEntry for the Model 4. See p. 100 for information on using checksums in Listings 1, 2 and 3.

```
10 ' MDENTRY/BAS  VER 1.0  03/05/87  = SEQUENTIAL =
20 ' BY WILLIAM MCMULLAN
30 ' RT 6 BOX 1, BASTROP, LA. 71220
40 CLEAR                                                              '*  491
50 READ F$,R                                                          '*  681
60 DIM LN$(R),PR$(R),R(R),C1(R),C2(R),PL(R)                           '*  2441
70 R1=R-1:IF R1>9 THEN R1=2 ELSE R1=1                                 '*  2197
80 CLS:GOSUB 1100:CLS:PRINT @(12,20),"ENTER FILE NAME   ........
   /DAT"                                                              '*  4050
90 PRINT @(12,38),"";:LINE INPUT FF$:FF$=FF$+"/DAT":IF FF$="/DAT
   " THEN FF$=F$                                                      '*  4484
100 PRINT:PRINT "YOU ARE ABOUT TO CREATE A FILE NAMED ["FF$"] IS
    THIS CORRECT <Y>/<N>"                                           '*  5554
110 GOSUB 900:IF  L$="Y" OR L$="y" THEN 120 ELSE 80                   '*  2908
120 GOSUB 710:CLS                                                     '*  1031
130 OPEN "E",1,FF$                                                    '*  968
140 '
200 ' ************* PROMPT FOR ENTRIES *****************
210 PRINT @(0,0),STRING$(80,"-")                                      '*  1786
220 FOR X=1 TO J                                                      '*  942
230 PRINT @(R(X),C1(X)),"<"X"> "+PR$(X);                              '*  2226
240 PRINT @(R(X),C2(X)),STRING$(PL(X),"_");:PRINT @(R(X),C2(X)),
    "";                                                             '*  3944
250 IF R(X)>BT THEN BT=R(X)                                           '*  1650
260 NEXT X                                                            '*  623
270 PRINT @(BT+1,0),STRING$(80,"-"):PRINT @(BT+2,0),STRING$(80,"
    ")                                                              '*  3833
280 PRINT @(BT+2,36),"<F3> QUIT";                                     '*  1921
290 FOR X=1 TO J:GOSUB 600:NEXT X                                     '*  2070
300 PRINT @(BT+2,0),"          <F1> SAVE          <F2> CHA
    NGE          <F3> QUIT  ";                                      '*  4409
310 PRINT @(BT+2,70),"";:                                             '*  1373
320 GOSUB 900:B$=L$                                                   '*  1083
330 IF B$=CHR$(129) THEN 370                                          '*  1535
340 IF B$=CHR$(130) THEN GOSUB 510:GOTO 320                           '*  2492
350 IF B$=CHR$(131) THEN CLOSE 1:CLS:END                              '*  2388
360 GOTO 310                                                          '*  678
370 FOR Y=1 TO J:OP$=OP$+LN$(Y)+CHR$(34)+","+CHR$(34):NEXT Y          '*  3482
380 LL=LEN(OP$):OP$=LEFT$(OP$,LL-3)                                   '*  2116
400 ' ***************** EXTEND FILE & WRITE DATA ***************
420 WRITE#1,OP$                                                       '*  900
430 '
440 OP$="":GOTO 200                                                   '*  1057
500 ' ************* CHANGE ENTRY ****************
510 PRINT @(BT+3,20),"ENTER ENTRY TO CHANGE 1 TO ";J;:GOSUB 1000
    :PRINT @(BT+3,20),STRING$(32," ");                              '*  5840
520 GOSUB 610:PRINT @(BT+2,70),"";:RETURN                             '*  2481
600 ' ************* PROMPT ROUTINE *****************
610 PRINT @(R(X),C2(X)),STRING$(PL(X),".");:PRINT @(R(X),C2(X)-1
    ),">";                                                          '*  4052
620 GOSUB 800                                                         '*  752
630 PRINT @(R(X),C2(X)-1)," ";                                        '*  1637
640 RETURN                                                            '*  666
700 ' ***************** CREATE FILE & READ DATA ****************
710 J=J+1:READ PR$(J),R(J),C1(J),C2(J),PL(J)                          '*  2479
720 '
730 IF PR$(J)="END" THEN J=J-1:RETURN                                 '*  2266
740 GOTO 710                                                          '*  684
800 ' ************* INKEY$ INPUT ROUTINE *********************
810 LN$(X)=""                                                         '*  673
820 L$="":WHILE L$="":L$=INKEY$:WEND                                  '*  2146
830 IF L$=CHR$(131) THEN CLS:END                                      '*  1888
840 IF L$=CHR$(8) THEN IF LEN(LN$(X))=0 THEN 820 ELSE P=POS(X)-2
    :PRINT @(R(X),P),".";:PRINT @(R(X),P),"";:LN$(X)=LEFT$(LN$(X
    ),LEN(LN$(X))-1):GOTO 820 : ' BACKSPACE                         '*  8876
850 IF L$=CHR$(13) THEN RETURN ELSE PRINT L$;                         '*  2783
860 LN$(X)=LN$(X)+L$:IF LEN(LN$(X))=PL(X) THEN RETURN                 '*  3253
870 GOTO 820                                                          '*  690
900 ' ************* SINGLE KEY INKEY ROUTINE ******************
910 L$="":WHILE L$="":L$=INKEY$:WEND:RETURN                           '*  2684
1000 ' ************* MULTI KEYSTROKE ROUTINE ******************
1010 PRINT @(BT+3,51),STRING$(R1,"."):PRINT @(BT+3,51),"":X$=I
    NPUT$(R1):X=VAL(X$):IF X>J THEN PRINT @(BT+3,51),"    ";:GO
    TO 1000                                                         '*  7576
1020 IF X=0 THEN 1010                                                 '*  1160
1030 RETURN                                                           '*  708
1100 ' ********************* INTRO ****************************
1110 K3$=STRING$(80,131)                                              '*  1335
1120 CLS:PRINT @(1,0),K3$;                                            '*  1492
1130 FOR JJ=1 TO 22:PRINT @(JJ,0),CHR$(191);:PRINT @(JJ,79),CHR$
    (191);:NEXT                                                     '*  4454
```

Listing 1 continued

Listing 1 continued

```
1140 PRINT @(22,2),K3$;                                                    '*  1263
1150 PRINT @(4,28),STRING$(21,131);                                        '*  1990
1160 PRINT @(5,30),"M D  -  E N T R Y";                                    '*  2053
1170 PRINT @(6,28),STRING$(21,140);                                        '*  1994
1180 PRINT @(11,14),"M U L T I P U R P O S E     D A T A     E
     N T R Y";                                                             '*  3819
1190 PRINT @(14,31),"S O F T W A R E";                                     '*  2068
1200 PRINT @(19,26),"WRITTEN BY WILLIAM MCMULLAN";                         '*  3162
1210 FOR JJ=1 TO 1000:NEXT JJ                                              '*  1726
1220 RETURN                                                                '*   709
1300 ' ************ FIELD DATA STATEMENTS **********************
1310 DATA "TEST/DAT:1",9 ' DEFAULT FILE NAME & NO. OF FIELDS + 1           '*  1403
1320 ' DATA  PROMPT,ROW,COL1,COL2,LENGTH
1330 DATA "LAST NAME",1,1,19,20                                            '*  1720
1340 DATA "FIRST NAME",2,1,19,20                                           '*  1806
1350 DATA "MID.  NAME",3,1,19,12                                           '*  1713
1360 DATA "ADDRESS",4,1,19,20                                              '*  1615
1370 DATA "CITY",1,45,62,14                                                '*  1465
1380 DATA "STATE",2,45,62,2                                                '*  1488
1390 DATA "ZIP CODE",3,45,62,5                                             '*  1666
1400 DATA "PHONE",4,45,62,12                                               '*  1525
1410 DATA "END",0,0,0,0                                                    '*  1195
```

End

Program Listing 2. MDEntry for the Tandy 1000.

```
10 ' MDENTRY.BAS VER 1.0  03/05/87  = SEQUENTIAL =
20 ' BY WILLIAM MCMULLAN
30 ' RT 6 BOX 1, BASTROP, LA. 71220
40 CLEAR                                                                   '*   491
42 DEFINT A-Z                                                              '*   808
45 KEY 1,CHR$(129):KEY 2,CHR$(130):KEY 3,CHR$(131):KEY OFF                '*  3339
50 READ F$,R                                                               '*   681
60 DIM LN$(R),PR$(R),R(R),C1(R),C2(R),PL(R)                                '*  2441
70 R1=R-1:IF R1>9 THEN R1=2 ELSE R1=1                                      '*  2197
80 CLS:GOSUB 1100:CLS:LOCATE 13,21:PRINT "ENTER FILE NAME    ____
   ____.DAT"                                                               '*  4784
90 LOCATE 13,39:LINE INPUT FF$:FF$=FF$+".DAT":IF FF$=".DAT" THEN
   FF$=F$                                                                  '*  4211
100 PRINT:PRINT "YOU ARE ABOUT TO CREATE A FILE NAMED ["FF$"] IS
    THIS CORRECT <Y>/<N>"                                                  '*  5554
110 GOSUB 900:IF  L$="Y" OR L$="y" THEN 120 ELSE 80                        '*  2908
120 GOSUB 710:CLS                                                          '*  1031
130 OPEN "A",1,FF$                                                         '*   964
140 '
200 ' ************* PROMPT FOR ENTRIES *****************
210 LOCATE 1,1:PRINT STRING$(80,"-")                                       '*  2129
220 FOR X=1 TO J                                                           '*   942
230 LOCATE R(X),C1(X):PRINT "<"X"> "+PR$(X);                               '*  2567
240 LOCATE R(X),C2(X):PRINT STRING$(PL(X),"_");:LOCATE R(X),C2(X
    )                                                                      '*  4012
250 IF R(X)>BT THEN BT=R(X)                                                '*  1650
260 NEXT X                                                                 '*   623
270 LOCATE BT+1,1:PRINT STRING$(80,"-"):PRINT STRING$(80," ")              '*  3651
280 LOCATE BT+2,34:PRINT "<F3> QUIT";                                      '*  2260
290 FOR X=1 TO J:GOSUB 600:NEXT X                                          '*  2070
300 LOCATE BT+2,1:PRINT "              <F1> SAVE             <F2>
    CHANGE          <F3> QUIT  ";                                          '*  4751
310 LOCATE BT+2,71:                                                        '*  1101
320 GOSUB 900:B$=L$                                                        '*  1083
330 IF B$=CHR$(129) THEN 370                                               '*  1535
340 IF B$=CHR$(130) THEN GOSUB 510:GOTO 320                                '*  2492
350 IF B$=CHR$(131) THEN CLOSE 1:CLS:END                                   '*  2388
360 GOTO 310                                                               '*   678
370 FOR Y=1 TO J:OP$=OP$+LN$(Y)+CHR$(34)+","+CHR$(34):NEXT Y               '*  3482
380 LL=LEN(OP$):OP$=LEFT$(OP$,LL-3)                                        '*  2116
400 ' ******** EXTEND FILE & WRITE DATA ********
420 WRITE#1,OP$                                                            '*   900
430 '
440 OP$="":GOTO 200                                                        '*  1057
500 ' ************* CHANGE ENTRY ***************
510 LOCATE BT+3,21:PRINT "ENTER ENTRY TO CHANGE 1 TO ";J;:GOSUB
    1000:LOCATE BT+3,21:PRINT STRING$(32," ");                             '*  6524
520 GOSUB 610:LOCATE BT+2,71:RETURN                                        '*  2209
600 ' ************ PROMPT ROUTINE ***************
610 LOCATE R(X),C2(X):PRINT STRING$(PL(X),".");:LOCATE R(X),C2(X
    )-1:PRINT ">";                                                         '*  4734
620 GOSUB 800                                                              '*   752
630 LOCATE R(X),C2(X)-1:PRINT " ";                                         '*  1978
640 RETURN                                                                 '*   666
700 ' ********* CREATE FILE & READ DATA *********
710 J=J+1:READ PR$(J),R(J),C1(J),C2(J),PL(J)                               '*  2479
720 '
730 IF PR$(J)="END" THEN J=J-1:RETURN                                      '*  2266
740 GOTO 710                                                               '*   684
800 ' ********* INKEY$ INPUT ROUTINE *************
810 LN$(X)=""                                                              '*   673
820 L$="":WHILE L$="":L$=INKEY$:WEND                                       '*  2146
830 IF L$=CHR$(131) THEN CLS:END                                           '*  1888
840 IF L$=CHR$(8) THEN IF LEN(LN$(X))=0 THEN 820 ELSE P=POS(X)-1
    :LOCATE R(X),P:PRINT " ";:LOCATE R(X),P:LN$(X)=LEFT$(LN$(X),
    LEN(LN$(X))-1):GOTO 820  ' BACKSPACE                                   '*  8853
850 IF L$=CHR$(13) THEN RETURN ELSE PRINT L$;                              '*  2783
860 LN$(X)=LN$(X)+L$:IF LEN(LN$(X))=PL(X) THEN RETURN                      '*  3253
870 GOTO 820                                                               '*   690
900 ' ******** SINGLE KEY INKEY ROUTINE *************
910 L$="":WHILE L$="":L$=INKEY$:WEND:RETURN                                '*  2684
1000 ' ********* MULTI KEYSTROKE ROUTINE ***********
1010 LOCATE BT+3,52:PRINT STRING$(R1,"");:LOCATE BT+3,52:X$=INP
     UT$(R1):X=VAL(X$):IF X>J THEN LOCATE BT+3,52:PRINT "    ";:
     GOTO 1000                                                             '*  7988
1020 IF X=0 THEN 1010                                                      '*  1160
```

Listing 2 continued

You can create new programs under different names, saving a master copy of the program unaltered.

puts the words LAST NAME at row 2, column 2, expects a keyboard entry after the prompt at column 20, and limits the entry to 20 or fewer characters.

To use the program, first write your Data statements. You could save only the Data statements you want for other versions in ASCII and merge them with MDEntry as needed. Easier still, since this program is so short, you can create new programs under different file names for different uses, saving a master copy of the program unaltered.

Preliminaries

After you run MDEntry and a brief introduction appears, you are prompted for a file name. If you don't enter one, the program uses the default file name (see the line 1310 in the Data statements). I have used the name TEST/DAT, or in MS-DOS TEST.DAT, and the number after the file name (I used the number 9, which represents nine fields including the "end" or dummy field).

If you increase or decrease the fields, you must change this number accordingly. This line must be the first of the Data statements since line 50 reads it to get the default file name and the number of fields. Line 60 also uses the field number to dimension the arrays. You might want to change the file name in the Data statement or bypass the file-name entry prompt completely. If you do, change line 80 to:

```
80 CLS:GOSUB 1100:FF$=F$:GOTO 120
```

In the MS-DOS version I used line 45 to define the function keys, setting their values to the same ones used in the TRSDOS version. The KEY OFF at the end of the line prevents the Key reference line from cluttering up row 25 of the screen.

The MS-DOS version of the program differs little from the TRSDOS version. Locate statements replace Print@ statements. The numbers in the Locate statements are one more than those in the Print@ statements, because of row and column numbering systems of the two machines. In the Open statement in line 130, under TRSDOS, the letter "E" extends a sequential file; "A" under MS-DOS does the same thing. For random or direct-access files, use an "R" for both.

Listing 2 continued

```
1030 RETURN                                                          '*   708
1100 ' ********** INTRO ************************
1110 K3$=STRING$(80,219)                                             '*  1342
1120 CLS:LOCATE 1,1:PRINT K3$;                                       '*  1834
1130 FOR JJ=1 TO 24:LOCATE JJ,1:PRINT CHR$(219);:LOCATE JJ,80:PR
     INT CHR$(219);:NEXT                                             '*  5133
1140 LOCATE 23,3:PRINT K3$;                                          '*  1606
1150 LOCATE 5,29:PRINT STRING$(21,223);                              '*  2335
1160 LOCATE 6,31:PRINT "M D  -  E N T R Y";                          '*  2396
1170 LOCATE 7,29:PRINT STRING$(21,220);                              '*  2336
1180 LOCATE 12,15:PRINT "M U L T I P U R P O S E     D A T A
     E N T R Y";                                                     '*  4162
1190 LOCATE 15,32:PRINT "S O F T W A R E";                           '*  2411
1200 LOCATE 20,27:PRINT "WRITTEN BY WILLIAM MCMULLAN";               '*  3496
1210 FOR JJ=1 TO 5000:NEXT JJ                                        '*  1730
1220 RETURN                                                          '*   709
1300 ' ******* FIELD DATA STATEMENTS ************
1310 DATA "TEST.DAT",9  'DEFAULT FILE NAME & NO. OF FIELDS + 1       '*  1295
1320 ' DATA  PROMPT,ROW,COL1,COL2,LENGTH
1330 DATA "LAST NAME",2,2,20,20                                      '*  1714
1340 DATA "FIRST NAME",3,2,20,20                                     '*  1800
1350 DATA "MID.  NAME",4,2,20,12                                     '*  1707
1360 DATA "ADDRESS",5,2,20,20                                        '*  1609
1370 DATA "CITY",2,46,63,14                                          '*  1468
1380 DATA "STATE",3,46,63,2                                          '*  1491
1390 DATA "ZIP CODE",4,46,63,5                                       '*  1669
1400 DATA "PHONE",5,46,63,12                                         '*  1528
1410 DATA "END",0,0,0,0                                              '*  1195
```

End

Program Listing 3. MDRandom for direct or random access files.

```
10 'MDENTRY/BAS VER 1.0  03/05/87  = RANDOM =                        '*  1179
130 OPEN "R",1,FF$,FT                                                '*  1304
140 FIELD 1, FT AS OP1$                                              '*  3675
370 FOR Y=1 TO J:LN$(Y)=LEFT$(LN$(Y)+STRING$(PL(Y)," "),PL(Y))       '*  1539
380 OP$=OP$+LN$(Y):NEXT Y                                            '*  1025
410 LSET OP1$=OP$                                                    '*  1434
420 NN=LOF(1)+1:PUT 1,NN                                             '*   507
430 OP$=""                                                           '*   675
440 GOTO 200                                                         '*   908
720 FT=FT+PL(J)
```

End

Direct Access

As it stands, MDEntry writes sequential files, but it can also write direct-access files. Load and save Program Listing 3 in ASCII using the statement SAVE "MDRANDOM/ASC",A (or in MS-DOS, SAVE "MDRANDOM.ASC",A).

Load MDEntry/BAS and merge MDRandom/ASC with the main program. Now you are set up to write direct- or random-access files. I pad the fields with spaces and then write them to disk in one block of data, rather than individual fields (see lines 370 and 380), because I have not found a way to field an unknown number of fields. The field I use is OP$ with FT bytes in it, where FT is the total bytes of all fields as calculated in line 720.

Model III Changes

If you are using the Model III, you need to convert the Print@ values and Data statements in the Model 4 version of MDEntry to accommodate the 64-character-wide screen. You also need to change the While. . .Wend statements to If. . . Then statements.

MDEntry Grows

You can use this program in conjunction with other programs, such as invoicing, checkbook entry, check writing, address labels, and inventory. You can also use it with commercial programs such as data bases, spreadsheets, and word processors. You might also elect to use MDEntry as a basis for a much larger program.

A Sample

After you have tested the program, try changing the Data statements and see how the screen adjusts as you add and delete statements. Now change the following lines.

For TRSDOS:

```
1310 DATA "CHECKBK/DAT",6
1330 DATA "CHECK NO:",1,52,70,6
1340 DATA "PAY TO:",3,1,15,30
1350 DATA "AMOUNT:",3,52,68,8
1360 DATA "FOR (DEPT):",6,1,20,10
1370 DATA "MEMO:",8,1,13,65
1410 DATA "END",0,0,0,0
```

For MS-DOS:

```
1310 DATA "CHECKBK.DAT",6
1330 DATA "CHECK NO:",2,53,71,6
1340 DATA "PAY TO:",4,2,16,30
1350 DATA "AMOUNT:",4,53,69,8
1360 DATA "FOR (DEPT):",7,2,21,10
1370 DATA "MEMO:",9,2,14,65
1410 DATA "END",0,0,0,0
```

Delete lines 1380, 1390, and 1400 for both systems.

Now you have a checkbook-entry or check-writing program in the making. You can improve the program by adding a number to the Data statement that would tell the program to process the entry in some special way, such as admit only numerics or alphanumerics, or dates. You are limited only by your imagination.■

William McMullan is a self-employed electronics technician, a ham-radio operator, and a computer hacker. Correspond with him at Route 6, Box 1, Bastrop, LA 71220.

by Thomas M. Swatloski

Test Tester

Perform statistical analysis on test and other data.

As a university professor and administrator in education, I found that analyzing test scores on a computer is much easier. I wrote Tee Test (see the Program Listing) for the Tandy 1000, but it runs on the Model 4 without modification and on the Models I and III with the substitution of an open bracket ([) or up arrow (↑) where the caret (^) appears.

Using raw test scores, this program accurately gives the standard deviation, mean, T ratio, F-test result, and Pearson's R for sets of pre- and posttest results (see the formulas in the Table) for groups of students as large as 50.

I designed the screen prompts with the classroom teacher in mind. However, the program could work just as well for other groups of data.

For larger sets of data, and of different varieties, change the DIM statements in line 50 to numbers that match your needs. For instance, for a list of 200 grades, or temperatures, or people of a certain height, you would need to put 200, at least, in the DIM statements for F#, FA#, O#,and OA#.

You can send the results of your computations to the screen or printer. A sample output is shown in the Figure. If you are using the Tandy 1000, your printer must be ready at the outset or the program will abort. If you want screen viewing only, omit the LPrint lines.

If you want to work with standard deviations and means for a single set of data, rather than both pre- and posttest results, run Tee Test entering the data for the pretest scores only. When the first score for posttest grades is requested, press enter. The program will process the first set of data. In this case, the T ratios, F-test results, and Pearson's R values have no meaning.■

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System Requirements

Model I/III/4 or Tandy 1000
48K RAM
Available on The Disk Series

Standard deviation = $[NEX^2 - (EX)^2]^{1/2}/N$

Mean = $[EX]/N$

Fisher's T = $(M_x - M_y)/[(EX^2 + EY^2)/(N(N-1))]^{1/2}$

F = EX^2/EY^2, or vice versa; keep larger in numerator

Pearson's R = $$\frac{NE(XY) - (EX)(EY)}{[(N(EX^2) - (EX)^2)(N(EY^2) - (EY)^2)]^{1/2}}$$

M = mean; E = sum of (usually Greek sigma); X = pretest score; Y = posttest score

Table. Formulas used for computing test results.

Program Listing. Tee Test for analyzing test scores. See p. 100 for information on using checksums.

```
10 ' "TEETEST.BAS"                                                    '*   357
20 ' Standard DEVIATIONS, MEANS, and T-RATIOS for PRE and POST t
   est results  using RAW scores.
30 CLS                                                                '*   764
40 CLEAR 10000                                                        '*  1907
50 DIM F#(50), FA#(50), O#(50), OA#(50)                               '*  2567
60 PRINT "    * * * * * * * * * * * * * * * * * * * * * * * * * * *  "  '*  2336
70 PRINT "    * *                                           * * "     '*  3112
80 PRINT "    * *          STANDARD DEVIATIONS              * * "     '*  2550
90 PRINT "    * *                MEANS                      * * "     '*  3507
100 PRINT "    * *   T-RATIOS, F-TEST AND PEARSON'S R       * * "     '*  4175
110 PRINT "    * *    of PREtest and POSTtest scores         * * "     '*  3689
120 PRINT "    * *        By: Thomas M. Swatloski            * * "     '*  2381
130 PRINT "    * *                                           * * "     '*  2382
140 PRINT "    * *                                           * * "     '*  2503
150 PRINT "    * * * * * * * * * * * * * * * * * * * * * * * * * * "  '*   580
160 PRINT                                                             '*  3971
165 PRINT "       MAKE SURE PRINTER IS READY OR PROGRAM ABORTS"
170 PRINT "NOTE: Scores must be input slowly.  Otherwise ZERO is
    seen by                                                           '*  6074
171 PRINT "           the computer as the end of the scores."         '*  4537
180 PRINT                                                             '*   582
190 INPUT "Number of Students in this Group "; T                      '*  3921
195 IF T=0 THEN GOTO 190                                              '*  1425
200 INPUT "GROUP NAME: "; U$                                          '*  1698
210 CLS                                                               '*   405
220 F#=0: FT#=0: G#=0: H#=0: I#=0: J#=0: K#=0: Y#=0: L#=0: O#=0:
    P#=0: Q#=0: R#=0: S#=0: V#=0: W#=0                                '*  5166
230 FOR N = 1 TO T                                                    '*  1007
240 PRINT "PRE SCORE FOR STUDENT "; N;":";: INPUT F#(N)               '*  3399
250 IF F#(N) = 0 THEN 350                                             '*  1314
260 FT# = FT# + F#(N)                                                 '*  1058
270 L# = FT#/N                                                        '*   735
280 G# = G# + ((F#(N))^2)                                             '*  1200
290 H# = FT#^2                                                        '*   752
300 I# = ((N * G#) - H#)                                              '*  1080
310 J# = I#^(1/2)                                                     '*   843
320 K# = J#/N                                                         '*   650
330 IF N = T THEN 370                                                 '*  1165
340 NEXT N                                                            '*   612
350 N = N - 1                                                         '*   623
360 T = N                                                             '*   472
370 PRINT "THE STANDARD DEVIATION FOR THE PRETEST IS "; USING "#
    ###.##"; K#                                                       '*  4601
380 FA#=0: FH#=0: GA#=0: HA#=0: IA#=0: JA#=0: KA#=0: LA#=0: OA#=
    0: PA#=0: PRINT : PRINT                                           '*  4840
390 FOR N = 1 TO T                                                    '*  1014
400 PRINT "POST SCORE FOR STUDENT "; N; ";";: INPUT FA#(N)            '*  3589
410 IF FA#(N) = 0 THEN 510                                            '*  1375
420 FH# = FH# + FA#(N)                                                '*  1097
430 LA# = FH#/N                                                       '*   786
440 GA# = GA# + ((FA#(N))^2)                                          '*  1393
450 HA# = FH#^2                                                       '*   803
460 IA# = ((N*GA#) - HA#)                                             '*  1218
```

Listing continued

Listing continued

```
470 JA# = IA#^(1/2)                                                    '*   980
480 KA# = JA#/N                                                        '*   787
490 IF N = T THEN 520                                                  '*  1169
500 NEXT N                                                             '*   610
510 N = N -1                                                           '*   589
520 PRINT "THE STANDARD DEVIATION FOR THE POSTTEST IS ";USING "#
    #.##";KA#                                                          '*  4624
530 FOR N = 1 TO T                                                     '*  1010
540 O#(N) = L# - P#(N)                                                 '*  1067
550 P# = (O#(N)^2) + P#                                                '*  1146
560 NEXT N                                                             '*   616
570 FOR N = 1 TO T                                                     '*  1014
580 OA#(N) = LA# - FA#(N)                                              '*  1266
590 PA# = (OA#(N)^2) + PA#                                             '*  1345
600 NEXT N                                                             '*   611
610 Q# = P# + PA#                                                      '*   826
620 N = N - 1                                                          '*   623
630 R# = N * (N - 1)                                                   '*   928
640 S# = Q#/R#                                                         '*   709
650 V# = S#^(1/2)                                                      '*   872
660 W# = (L# - LA#)/V#                                                 '*  1080
670 IF P#<PA# THEN X# = PA#/P#                                         '*  1676
680 IF P#>PA# THEN X# = P#/PA#                                         '*  1679
690 CLS                                                                '*   417
700 LPRINT "GROUP NAME: "; U$: LPRINT                                  '*  2339
710 LPRINT: LPRINT "FOR THIS GROUP N = "; T                            '*  2734
720 LPRINT                                                             '*   658
730 LPRINT "THE PRETEST SCORES ARE: "                                  '*  2400
740 FOR N = 1 TO T                                                     '*  1013
750 LPRINT F#(N),                                                      '*  1001
760 NEXT N                                                             '*   618
770 LPRINT : LPRINT                                                    '*  1258
780 LPRINT "THE POSTTEST SCORES ARE: "                                 '*  2500
790 FOR N = 1 TO T                                                     '*  1018
800 LPRINT FA#(N),                                                     '*  1062
810 NEXT N                                                             '*   614
820 FOR N = 1 TO T                                                     '*  1012
830 Y# = F#(N) * FA#(N) + Y#                                           '*  1366
840 NEXT N                                                             '*   617
850 N = N - 1                                                          '*   628
880 Z# = N * G# - H#                                                   '*   948
920 AA# = (N * GA#) - HA#                                              '*  1194
940 BB# = (Z# * AA#)^(1/2)                                             '*  1279
1000 CC# = FT# * FH#                                                   '*   991
1020 DD# = ((N * Y#) - CC#)/BB#                                        '*  1485
1040 PRINT TAB(25) U$: PRINT                                           '*  1697
1050 PRINT "THE STANDARD DEVIATION FOR THE PRETEST IS "; TAB(47)
     USING "####.##"; K#                                               '*  5080
1060 LPRINT: LPRINT: LPRINT "THE STANDARD DEVIATION FOR THE PRET
     EST IS "; TAB(47) USING "####.##"; K#                             '*  6283
1070 PRINT "THE MEAN FOR THE PRETEST IS "; TAB(57) USING "#####.
     ##"; L#: PRINT: PRINT                                             '*  5082
1080 LPRINT "THE MEAN FOR THE PRETEST IS "; TAB(57) USING "#####
     .##"; L#: LPRINT: LPRINT                                          '*  5311
1090 PRINT "THE STANDARD DEVIATION FOR THE POSTTEST IS "; TAB(47
     ) USING "####.##"; KA#                                            '*  5244
1100 LPRINT "THE STANDARD DEVIATION FOR THE POSTTEST IS "; TAB(4
     7) USING "####.##"; KA#                                           '*  5312
1110 PRINT "THE MEAN FOR THE POSTTEST IS "; TAB(57) USING "#####
     .##"; LA#                                                         '*  4263
1120 LPRINT "THE MEAN FOR THE POSTTEST IS ";TAB(57) USING "#####
     .##"; LA#                                                         '*  4308
1130 PRINT :PRINT "T = "; USING "###.##"; W#                           '*  2437
1140 PRINT "F = "; USING "###.##"; X#                                  '*  1938
1150 PRINT "PEARSON'S R = "; USING "##.##"; DD#                        '*  2654
1160 LPRINT :LPRINT "T = "; USING "###.##"; W#                         '*  2592
1170 LPRINT "F = "; USING "###.##"; X#                                 '*  2017
1180 LPRINT "PEARSON'S R = "; USING "##.##"; DD#                       '*  2733
1190 END                                                               '*   450
```

End

```
GROUP NAME: SAMPLE #3
FOR THIS GROUP N =  25

THE PRETEST SCORES ARE:
 89              99              84              85              73
 96              66              91              89              72
 65              99              96              97              84
 45              88              67              76              76
 78              95              36              75              67

THE POSTTEST SCORES ARE:
 77              55              85              96              82
 88              44              81              99              88
 99              33              85              85              94
 66              56              86              84              93
 66              87              94              83              95

THE STANDARD DEVIATION FOR THE PRETEST IS       15.80
THE MEAN FOR THE PRETEST IS                                     79.52

THE STANDARD DEVIATION FOR THE POSTTEST IS      16.96
THE MEAN FOR THE POSTTEST IS                                    80.04

T =  -0.11
F =   1.15
PEARSON'S R = -0.17
```

Figure. Sample output of Tee Test.

Continued from p. 48

separate message blocks near the end of the SCR17/CTL file.

To adapt his program, I put a shortened title, CMDMSG, and the 80-byte command buffer in the largest contiguous message block for the directory function (see Program Listings 2 and 3). In this process, extra space enabled partial reclamation of Superscripsit's "Press break for menu" message.

Jane A. Layman
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Spooli Sans Sequence

I entered the print spooler called Spooli (see "Leave the Printing to Spooli," by David A. Williams, May 1987, p. 58), and it failed to work after I assembled it using Microsoft's Macro Assembler version 4.0. I studied the matter for two hours and discovered the problem within the source code. The line ASSUME CS:CSEG,ES:CSEG,DS:CSEG causes the assembler to use the ES segment register on instructions that refer to memory. Replace this line with ASSUME CS:CSEG,DS:CSEG. The program now works on my Tandy 1000.

Ed Garcia
Youngsville, LA

Review Correction

Due to an editorial error, Jack Feldman's review of Teletrend's TT512P modem (May 1987, p. 40) incorrectly said the modem "uses the familiar IBM PC/AT dialing protocol." It uses the Hayes-compatible AT dialing protocol.

Substitute Characters

I have received a number of questions regarding my article "Deskmate Printer Control" (May 1987, p. 90). Some readers have identified a problem entering ^N and ^S within Edlin. Whenever it is necessary to enter these codes to create a printer control code table, you must precede the code with ^V. For example, when End Underline requires ^N (decimal 14), enter ^VN into the Edlin line. If a control code requires escape-^N (decimal 27 14), enter ^V[^VN. Also, some printer codes can be represented by three characters. Entering ^C to represent a decimal 03 only stops the exection of the Edlin Insert command; instead enter ^VC.

To invoke printer modes, you can use any number of characters, as long as you never expect to use them in text. Also, these characters can only be keyboard characters. Unfortunately, *80 Micro* misinterpreted a character in my manuscript and duplicated it incorrectly. An inverted question mark appeared instead of a reverse apostrophe, which is on the Tandy 1000 numeric keypad. Figure 1 shows the correct lines for CHR120.DAT when listed from Edlin.

Also I have come up with a couple of extra tips. To eliminate the annoying form feed generated by the Print command, replace PRINT CHR120.DAT /P with COPY CHR120.DAT PRN. The reset file containing ^X only controls LPDRVR. The printer must also be reset by turning if off and then on again. Finally, beware of any memory-resident programs that use ^V to invoke a particular function.

John Heenan
Placentia, CA

Program Listing 2. Model 4 Commander for Superscripsit 1.02.00.

```
10 ' R. K. Wright's Model 4 SuperScripsit DOS Command Patch
20 ' From 80 Micro, June -87, pp. 72ff.
30 ' Adapted for v. 1.02.00 by J. Layman
40 CLS:PRINT:PRINT TAB(22)"SuperSCRIPSIT Dos Command Installer":
   PRINT TAB(30)"by Randall K. Wright"                          '*  7668
50 PRINT:PRINT TAB(22)"Adapted for V. 1.02.00 by J. Layman":PRIN
   T:PRINT                                                      '*  5017
60 OPEN "R",1,"SCRI7/CTL":FIELD#1,174 AS A$,4 AS A$:GET 1,8     '*  3320
70 IF A$<>"1.02" THEN PRINT:PRINT TAB(15)"Version number does no
   t match! Aborting program.":PRINT:CLOSE 1:END                '*  8285
80 PRINT:PRINT TAB(5)"Preparing to install patches."            '*  4245
90 FIELD#1,177 AS A$,77 AS A$                                   '*  1560
100 FOR A=1 TO 50:READ B:U$=U$+CHR$(B):NEXT                     '*  2568
110 U$=U$+"(Press BREAK for Menu)"+CHR$(3)+CHR$(0)+CHR$(0)+CHR$(
    0)+CHR$(0)                                                  '*  4531
120 GET 1,1:LSET A$=U$:PUT 1,1                                  '*  1743
130 FIELD#1,246 AS A$,10 AS A$:U$=CHR$(28)+CHR$(31)+"*** SCRI"  '*  3326
140 GET 1,7:LSET A$=U$:PUT 1,7                                  '*  1757
150 FIELD#1,4 AS A$,114 AS A$,110 AS B$,22 AS B$                '*  2500
160 U$="PSIT--DOS COMMAND ***"+CHR$(10)+CHR$(10)+"Command? "+CHR
    $(14)+CHR$(3)+"80 byte command line buffer is here":V$="Dos
    Command"                                                    '*  9167
170 GET 1,8:LSET A$=U$:LSET B$=V$:PUT 1,8                       '*  2449
180 PRINT:PRINT TAB(5)"Done":PRINT:PRINT:CLOSE 1:END            '*  3572
190 DATA 62,101,239,253,203,18,166,33,154,148,62,10,239         '*  2773
200 DATA 33,186,148,239,1,0,79,33,198,148,62,9,239,56,13        '*  2840
210 DATA 62,25,239,33,158,142,62,10,239,62,10,24,228,62         '*  2763
220 DATA 2,14,15,239,195,253,142,10                             '*  1774
```

End

Program Listing 3. Source code for Commander for Superscripsit 1.02.00.

```
00100 ; R. K. Wright's Model 4 SuperSCRIPSIT Dos Command Patch
00110 ; From 80 MICRO, June -87, pp. 72ff.
00120 ; Adapted for Version 1.02.00 by J. Layman
00130           ORG     9584H
00140           DEFM    'Dos Command                    ; 11 SPACES
00150           ORG     949AH
00160 TITLE     DEFW    1F1CH
00170           DEFM    '*** SCRIPSIT--DOS COMMAND ***'
00180           DEFB    10
00190 CMDMSG    DEFB    10
00200           DEFM    'Command? '
00210           DEFW    030EH
00220 BUFFER    DEFS    80              ;'80 byte command line buffer is here'
00230           ORG     8E6DH
00240 COMAND    LD      A,101
00250           RST     28H
00260           RES     4,(IY+18)       ;ENABLE BREAK KEY
00270           LD      HL,TITLE
00280           LD      A,10            ;@DSPLY
00290           RST     28H
00300 REDO      LD      HL,CMDMSG
00310           RST     28H
00320           LD      BC,4F00H
00330           LD      HL,BUFFER
00340           LD      A,9             ;@KEYIN
00350           RST     28H
00360           JR      C,RETURN
00370           LD      A,25            ;@CMNDR
00380           RST     28H
00390           LD      HL,BRKMSG
00400           LD      A,10
00410           RST     28H
00420           LD      A,10
00430           JR      REDO
00440 RETURN    LD      A,2
00450           LD      C,15
00460           RST     28H
00470           JP      8EFDH
00480 BRKMSG    DEFB    10
00490           DEFM    '(Press BREAK for Menu)'
00500           DEFB    3
00510           NOP
00520           NOP
00530           NOP
00540           NOP
00550 PRGEND    EQU     $-1
00560           END     8EB9H
```

End

```
*L      1: ^[W^A{^O
        2: ^[W^A}^N
        3: ^[W^B\^[^N
        4: ^[W^B|^[^O
        5: ^[W^B~^[^T
        6: ^[W^B`^[^S
```

Figure. The correct lines for CHR120.DAT when listed from Edlin.

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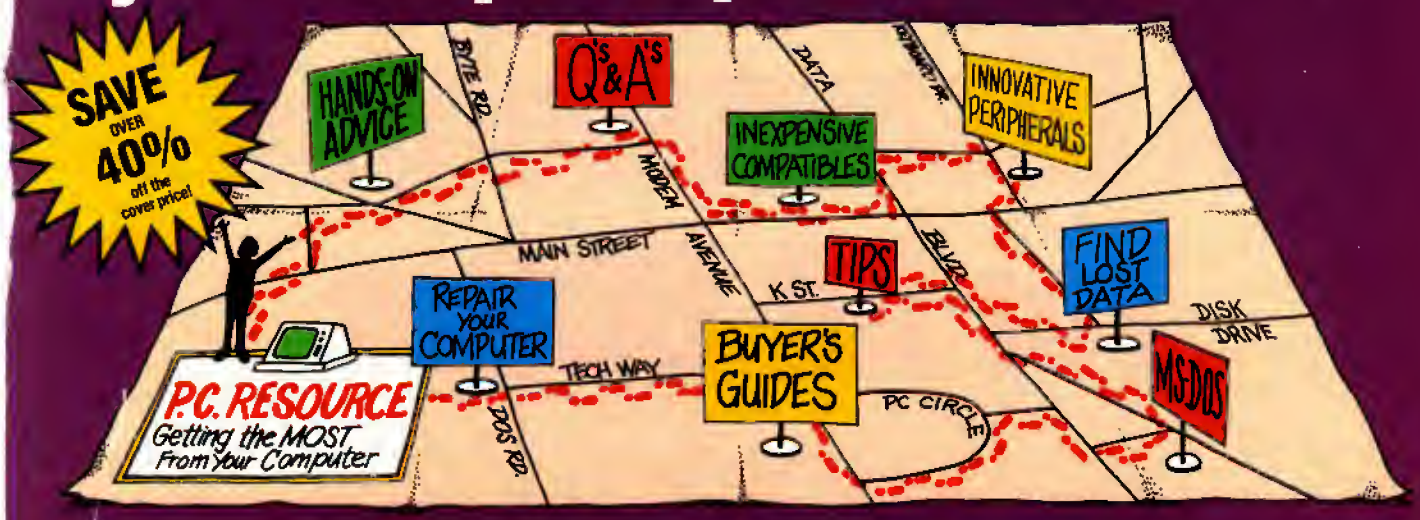

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A Disassembler For All DOSes

by David Goben

Disassemble any Model I/III/4 assembly listing written under nearly any DOS.

If you are looking for a high-speed disassembler for your Model I, III, or 4, try my DISASM/CMD program that runs on all three machines under any operating system except CP/M. DISASM will be especially useful for those of you who have more than one model and use a variety of operating systems. With DISASM, you can disassemble programs you don't have the source code for and customize your commercial software.

This disassembler has some special features. One key feature is that it disassembles memory-resident program codes and disk-resident machine-language programs with equal ease. It can also hurdle many problems that some low-end commercial disassemblers cannot, such as byte spanning in the middle of an instruction line on a disk-resident file. DISASM accepts a variety of load-module (CMD) formats, including patch, comments, yank, and others used by LDOS and LS-DOS.

In addition, DISASM supports the undocumented instruction sets that Zilog (makers of the computers' Z80 chip) did not officially release in its instruction-set data sheets. These commands include manipulation of the upper and lower bytes of the IX and IY index registers, as well as the index register–related mathematical and logical operations. (You can find references to these instructions in Radio Shack's Assembly Language Development System [ALDS] and some more recent Z80 manuals.)

System Requirements

Model I/III/4
32K RAM
Any operating system except CP/M
Available on The Disk Series

Determining the Environment

DISASM (see the Program Listing) begins by determining the environment under which it is operating and acts upon these results accordingly. When operating on a Model I or III, it uses system calls common to both computers to communicate with the system and the operator. When working in the Model 4 mode, it uses the TRSDOS/LS-DOS 6 supervisory calls. The only exception is Model 4 Multidos, which uses the Model III calls (it is a virtual work-alike of the III system).

DISASM processes the machine code bytes by testing for specific bit patterns. This method tells the system what class of process the opcode will be performing, and, according to the results, DISASM goes to a routine that can manipulate that class of operation. This routine in turn tests other bits within the byte(s) to determine with which registers it will be operating and the proper output syntax to use. This technique allows a faster processing time and requires less program memory space, thus providing you with higher speed output.

Because DISASM is written in assembly code, it operates extremely fast. Since it is long (although short in comparison to other machine-language disassemblers), I converted it into hexadecimal (hex) data statements for page-space economy and convenience for those without assemblers. Regular checksums were omitted because the program itself contains a checksum verification. (The source code for DISASM is available on the *80 Micro* Disk Series. You can also request the source-code listing from the Technical Dept., *80 Micro*, 80 Elm St., Peterborough, NH 03458. Please enclose a stamped ($1), self-addressed, 8½- by 11-inch envelope.)

Operating DISASM

You can execute DISASM/BAS from Basic on the Model I, III, or 4. It creates a file called DISASM/CMD, which you can run from the DOS level by entering DISASM from the DOS Ready prompt.

When you run DISASM a short sign-on message asks if you want to disassemble from memory or disk. The asterisk (*) beside the "D" selection indicates the default if you press the enter key.

You select "M" for main memory to enter the main memory address where you want to begin disassembling (a hex value from zero to FFFF, such as 54AB). Next enter the byte count (in hex) to indicate the amount of memory to disassemble.

If you elect to disassemble a disk file, you are asked for its file name. Include an extension if it has one; you can also add a drive name. This file must be in CMD file format, which is common to files with such extensions as CMD, FLT, DVR, and DCT.

Whether you disassemble from memory or disk, DISASM asks if you want to send the resulting disassembly to the printer. If you select "N" (no), you will be asked if you want to send the output to a disk file. If you select "Y," you are prompted for a file name. The disassembly will be sent to the disk and display. Be sure you have plenty of space on the disk for the disassembly. If you run out of disk

Photo by Larry Dunn

```
;sample entry point for a hypothetical transportable program
;designed for the Models I, II, III, and 4.

        ORG     5200H           ;start of program (or PSECT 5200H)

MAIN    PUSH    HL              ;save used registers
        PUSH    DE
        LD      HL,(9)          ;get RST 8 vector address
        LD      DE,4000H        ;set Model I/III address
        XOR     A               ;reset carry and set zero
        SBC     HL,DE           ;set zero if models 1 or 3
        JR      Z,MDL13         ;is 1 or 3
;is model II/4. Test for mutlidos
        LD      DE,0BEE3H-4000H ;special test for Model 4 MULTIDOS
        SBC     HL,DE
        JR      NZ,MAIN2        ;not MULTIDOS
        JR      SETMD           ;else set as Model III
;is a Model I or III
;MDL13  LD      A,(125H)        ;test for Model III
        SUB     'I'
        LD      A,1             ;set flag for model I
        JR      NZ,MAIN2        ;is Model I
SETMD   LD      A,3             ;else set for Model III

MAIN2   LD      (MAIN),A        ;set environ.
        POP     DE              ;get used registers
        POP     HL
;resume normal program set-up here
.
.
.
```

Fig. 1. Sample entry point of a transportable program.

```
;sample routines for hypothetical transportable program
;for Models I, II, III, and 4
.
.
.
;previous code is main program

;routine to test environ. Z/NC=Model I, C=Model II/4, NZ/NC=Model III
CHKMDL  PUSH    HL              ;save used register
        LD      HL,(MAIN)       ;get flag to 'L'
        DEC     L               ;set proper flags
        POP     HL              ;get used register
        RET                     ;return to caller
;-------
;get DOS high memory address from proper system into HL register
GETMEM  CALL    CHKMDL          ;check environ
        JR      C,MEM24         ;is Model II/4
        JR      NZ,MEM3         ;is Model III
MEM1    LD      HL,(4049H)      ;get Model I himem
        RET

MEM3    LD      HL,(4411H)      ;get Model III himem
        RET

MEM24   PUSH    BC              ;save used register
        LD      HL,$-$          ;null registers
        LD      B,H
        LD      A,100           ;get Model II/4 himem
        RST     28H
        POP     BC              ;get used register
        RET
;-------
;display ASCII byte in register 'A'
DSP     CALL    CHKMDL          ;check environ.
        JP      NC,0033H        ;display on Model I/III
        PUSH    BC              ;save used register
        LD      C,A             ;byte to C
        LD      A,2             ;display byte on II/4
        RST     28H
        POP     BC              ;get used registers
        RET
;-------
;program continues from here
.
.
.
```

Fig. 2. Sample outlines for a transportable program.

Program Listing. Disassemble.

```
1 'DISASM/BAS AND DISASM/CMD  BY DAVID GOBEN
2 ' PERMISSION GIVEN TO USE, NOT TO SELL
10 'DATA POKE FORMAT CREATED ON DATAPOKE/BAS
20 CLS:PRINT"BUILDING 'DISASM/CMD'":RESTORE
30 OPEN"O",1,"DISASM/CMD":L=90:HX$="0123456789ABCDEF"
40 CS=0:L=L+10
```

Listing continued

space, the disassembly will continue very slowly to the screen. If you respond "N" to the disk-file question, the disassembly is sent to the video monitor one screen page at a time, and you are prompted at the end of each page to press the enter key to continue.

DISASM does not need to be modified for different operating systems or computers.

If you decide to send the disassembly to the printer, you are asked for the number of lines per page. The default value is 54. This allows a one-inch top and bottom margin on a page of 66 lines. Next you are asked for the page length. The default is 66. Finally DISASM asks if you want to pause between printed pages. This feature is handy if you are feeding individual sheets to the printer.

DISASM lets you break out of any operation or prompt by pressing the break key.

Output Format

The DISASM's display output uses five fields. Field 1 is the beginning address of an individual machine-language operation, the address of the opcode, in 4-byte hex format. Field 2 lists all byte values, in hex format, that belong to that instruction. Field 3 displays the opcode, the main instruction class for that line. Field 4 displays the operand, the registers or process that the opcode will use or perform. If the opcode does not require an operand, then this field is left blank.

Finally, Field 5 gives the screen-displayable representations of the bytes in Field 2. If a value is a control code, a value from zero to 31, or from 128 to 255, it is shown as a period. This last field lets you quickly distinguish if the disassembly is displaying garbage or text data, such as message sections, which allow you to read the information without having to further hand-translate.

Making Programs Transportable

DISASM is a transportable program. This means it does not need to be modified for various operating systems or a number of different computers.

The methods I use for this transportability are simple and short. Since the Model I, III, and 4 share the same CPU

(the Z80), any program segments that do not perform system input/output (I/O) will run on all machines. Well over 95 percent of all Z80 program code is already fully transportable. Communications with the operating system and the computer account for the remaining 5 percent. If during each I/O operation the program could determine under which system it was running, it could select the proper syntax and method for communicating with its host.

The easiest way to do this is to test an individual flag set in memory. For example, if a certain byte in memory contains a zero, then the program would process one type of function pertinent to one computer. If the value is non-zero, it could use another routine to perform the same function on a different system.

Figure 1 shows the entry point of a hypothetical transportable program. This program segment saves the HL register because, during program entry, you might have entered parameters after the file name, which you will want HL to point to. The DE register is saved because DE might be pointing to a drive-code table if an LDOS/LS-DOS program is executing the program via the System Library command. The program tests memory location 9 because the value 4000 hex is stored here on Models I and III. This is just one possible test. Another might involve saving a low memory value, poking something else there, testing to see if the Poke took hold, and replacing the original byte. If the Poke worked, then a Model II or 4 is the host.

The program also distinguishes between the Models I and III by checking hex location 0125 for an "I." If it is there, then the system is a Model III. This is important if your program will later access high memory, which is stored at 4049 hex on a Model I and at 4411 hex on a Model III. It is also significant if you use the operating system to output text message strings; the Model I uses the system call at 4467 hex while the Model III uses 021B hex.

In most instances, the program must only check if it is operating on either a Model I/III system or a II/4.

The program uses the Main address for storing the flag. In Model II or 4, it stores a zero here. A "1" will be there in Model I and a "3" in a Model III.

In most instances, the program must only check if it is operating on either a Model I/III system or a II/4. To do so, the program checks bit zero of Main. You can use an index register such as IY to point to the address and test the bit. It will be reset (zero) if it is a Model II or 4 and set (1) if it is a Model I or III. The I/III test can further be broken down by testing bit 1, which will be set on a Model III.

System Constraints

The most restrictive member of a computer or DOS determines a transportable program's memory constraints. This means a program cannot invade the highest of the lowest and the lowest of the highest memory limits of any specified system it is to support. Although a system such as a Model 4 can have a low memory limit of 3000 hex, it must still follow with the Model I/III constraints, in this case, 5200 hex. Thus you cannot place code below 5200 hex.

Figure 2 shows how two different routines can use this test. In this example, when routine CHKMDL is called, it returns a Zero/No Carry (Z/NC) state if the system is a Model I, a Carry (C) state for a Model II or 4, and a Not Zero/No Carry (NZ/NC) state for a Model III. Routine GETMEM acts according to these three states, and routine DSP acts only between the two states of Model I/III (Carry reset) and II/4 (Carry set).■

David Goben is a programming consultant. Write to him at 67 Highland Road, Mansfield Center, CT 06250.

Listing continued

```
50 READ A$:IF A$="END"THEN CLOSE:END
55 IF LEFT$(A$,1)<>"-" THEN 70
60 IF VAL(MID$(A$,2))=CS THEN 40 ELSE PRINT"CHECKSUM ERROR I
   N LINE"L:END
70 A=INSTR(HX$,LEFT$(A$,1))*16+INSTR(HX$,RIGHT$(A$,1))-17
80 PRINT #1,CHR$(A);:CS=CS+A:GOTO 50
90 ''' DATA AREA '''
100 DATA 05,09,00,00,00,44,49,53,41,53,4D,05,09,00,64,-577
110 DATA 56,20,20,20,20,20,20,01,FE,64,56,ED,73,A5,63,-1335
120 DATA 31,1E,52,2A,09,00,11,00,40,AF,ED,52,28,09,11,-853
130 DATA E3,7E,ED,52,20,18,18,0E,3E,0E,32,15,57,3A,25,-1095
140 DATA 01,D6,49,3E,01,20,08,21,11,44,22,B2,59,3E,03,-875
150 DATA 32,64,56,CD,8C,64,1C,1F,44,49,53,41,53,53,45,-1264
160 DATA 4D,20,31,2E,34,20,2D,20,4D,4F,44,45,4C,20,49,-839
170 DATA 2F,49,49,49,2F,34,20,4D,41,43,48,49,4E,45,20,-930
180 DATA 4C,41,4E,47,55,41,47,45,20,44,49,53,41,53,53,-1067
190 DATA 45,4D,42,4C,45,52,0D,43,4F,50,59,52,49,47,48,-1065
200 DATA 54,20,28,43,29,20,31,39,38,37,20,42,59,20,44,-800
210 DATA 41,56,49,44,20,47,4F,42,45,4E,2E,20,41,4C,4C,-982
220 DATA 20,52,49,47,48,54,53,20,52,45,53,45,52,56,45,-1069
230 DATA 44,0D,0D,00,31,1E,52,3E,16,32,03,65,32,51,65,-725
240 DATA AF,32,18,65,32,0B,65,32,06,63,3E,44,32,10,63,-962
250 DATA 32,2C,63,21,55,59,22,E6,64,22,E9,64,32,E5,60,-1506
260 DATA CD,8C,64,0E,44,49,53,41,53,53,45,4D,42,4C,45,-1271
270 DATA 20,4D,41,49,4E,20,4D,45,4D,4F,52,59,20,4F,52,-1023
280 DATA 20,44,49,53,4B,20,28,4D,01,FE,60,57,2F,2A,44,-1075
290 DATA 29,00,CD,BF,59,28,45,FE,44,28,41,FE,4D,20,C8,-1625
300 DATA 32,10,63,CD,8C,64,4D,41,49,4E,20,4D,45,4D,4F,-1237
310 DATA 52,59,20,41,44,44,52,45,53,53,00,CD,33,5A,28,-1107
320 DATA E4,22,22,63,22,E5,60,CD,8C,64,42,59,54,45,20,-1539
330 DATA 43,4F,55,4E,54,00,CD,33,5A,28,ED,22,17,63,18,-1196
340 DATA 60,CD,8C,64,4E,41,4D,45,20,4F,46,20,46,49,4C,-1262
350 DATA 45,20,54,4F,20,44,49,53,41,53,53,45,4D,42,4C,-1039
360 DATA 45,3F,20,00,01,00,17,CD,C8,59,11,00,55,CD,56,-1075
370 DATA 59,21,00,54,45,CD,60,59,2D,D9,21,ED,57,E5,E5,-1742
380 DATA CD,43,63,3E,01,32,2C,63,CD,05,63,32,0D,63,3E,-1160
390 DATA 01,32,06,63,3A,31,63,3C,32,31,63,2A,E5,60,2B,-1030
400 DATA 7C,B5,3E,1B,C4,D6,64,CD,8C,64,53,45,4E,44,20,-1679
410 DATA 44,49,53,41,53,53,45,4D,42,4C,59,20,54,4F,20,-1059
420 DATA 50,52,49,4E,54,45,52,1F,00,CD,18,5A,CA,D9,58,-1405
430 DATA FE,4E,CA,D9,58,3E,06,32,0B,65,3E,36,32,51,65,-1417
440 DATA CD,8C,64,4C,49,4E,45,53,20,54,4F,20,50,52,49,-1286
450 DATA 4E,54,20,50,45,52,20,50,41,01,FE,5C,58,47,45,-1177
460 DATA 20,28,44,45,46,41,55,4C,54,3D,35,34,29,00,CD,-1001
470 DATA 73,5A,38,D3,28,03,32,51,65,3A,51,65,B7,28,C8,-1410
480 DATA 32,03,65,CD,8C,64,50,41,47,45,20,4C,45,4E,47,-1210
490 DATA 54,48,20,28,44,45,46,41,55,4C,54,3D,36,36,29,-955
500 DATA 00,CD,73,5A,3B,DF,20,02,3E,42,2A,51,65,95,38,-1280
510 DATA D5,32,0B,65,CD,8C,64,50,41,55,53,45,20,42,45,-1369
520 DATA 54,57,45,45,4E,20,50,41,47,45,53,00,CD,18,5A,-1106
530 DATA 28,04,FE,4E,20,03,32,18,65,21,3B,00,22,E9,64,-1045
540 DATA C3,33,59,CD,8C,64,53,45,4E,44,20,4F,55,54,50,-1438
550 DATA 55,54,20,54,4F,20,44,49,53,4B,20,46,49,4C,45,-1015
560 DATA 1F,00,CD,18,5A,CA,33,59,FE,4E,CA,33,59,CD,8C,-1711
570 DATA 64,44,55,4D,50,20,46,49,4C,45,4E,41,4D,45,3A,-1077
580 DATA 20,00,01,00,17,CD,C8,59,11,32,56,CD,56,59,21,-1116
590 DATA 32,55,06,00,CD,BF,59,F6,01,32,18,65,21,1B,00,-1060
600 DATA 22,E6,64,3A,51,65,32,03,65,CD,4D,59,20,07,3E,-1230
610 DATA 65,EF,FD,CB,0A,86,CD,9B,5A,CD,A8,63,18,F8,FD,-2387
620 DATA 21,64,56,FD,CB,00,46,C9,CD,4D,01,FE,58,59,59,-1749
630 DATA C2,1C,44,3E,4E,EF,C9,CD,4D,59,28,17,CD,24,44,-1613
640 DATA C8,F6,C0,CD,4D,59,28,06,CD,09,44,C3,6F,63,4F,-1821
650 DATA 3E,1A,EF,18,F7,3E,3B,EF,18,E7,CD,4D,59,28,05,-1629
660 DATA CD,36,44,18,DD,3E,43,18,EF,CD,4D,59,28,05,CD,-1585
670 DATA 20,44,18,CF,3E,3A,18,E1,11,32,56,CD,4D,59,28,-1264
680 DATA 05,CD,28,44,18,BE,3E,3C,18,D0,CD,4D,59,2A,49,-1372
690 DATA 40,C0,C5,21,00,00,44,3E,64,EF,C1,C9,CD,8C,64,-1794
700 DATA 3F,20,00,01,00,04,21,E5,59,CD,FD,59,CD,4D,59,-1369
710 DATA 28,0D,CD,40,00,DA,6F,63,7E,CD,0F,5A,FE,0D,C9,-1654
720 DATA 3E,09,EF,18,F1,46,49,4C,45,4E,41,4D,45,2F,45,-1268
730 DATA 58,54,2E,50,41,53,53,57,4F,52,44,3A,44,2E,CD,-1222
740 DATA 4D,59,28,07,CD,2B,00,B7,20,FA,C9,3E,08,EF,28,-1476
750 DATA FB,C9,FE,61,D8,FE,7A,D0,E6,5F,C9,CD,8C,64,20,-2606
760 DATA 28,59,2F,2A,4E,29,00,CD,BF,59,C8,FE,59,28,06,-1411
770 DATA FE,4E,28,02,37,C9,B7,C9,CD,8C,64,20,28,48,45,-1672
780 DATA 58,29,00,CD,BF,59,C8,EB,21,00,00,1A,CD,0F,5A,-1418
790 DATA 13,FE,0D,28,E3,FE,30,38,04,FE,47,01,FE,54,5A,-1669
800 DATA 38,02,AF,C9,FE,3A,38,04,FE,41,38,F6,D6,30,FE,-1943
810 DATA 0A,38,02,D6,07,29,29,29,29,85,6F,30,D5,24,18,-1018
820 DATA D2,CD,BF,59,C8,EB,21,00,00,1A,CD,0F,5A,13,FE,-1772
830 DATA 0D,28,AD,FE,30,38,CE,FE,3A,30,CA,D6,30,44,4D,-1759
840 DATA 09,29,09,29,85,6F,30,E3,24,18,E0,CD,A5,60,CB,-1572
850 DATA 7F,CA,B1,5E,CB,77,CA,8F,5E,F5,E6,07,CA,73,5B,-2251
860 DATA 3D,CA,8A,5B,3D,CA,66,5B,3D,CA,DE,5B,3D,CA,47,-1858
```

Listing continued

Listing continued

```
 870 DATA 5B,3D,CA,E6,5A,3D,CA,D7,5A,CD,8C,64,52,53,54,-1936
 880 DATA 09,00,F1,D6,C7,CD,87,5E,C3,16,5F,F1,CD,4A,64,-2029
 890 DATA CD,A4,64,CD,A4,5E,CD,86,5E,18,EE,F1,CB,5F,20,-2198
 900 DATA 41,CD,8C,64,50,55,53,48,09,00,E6,30,0F,0F,0F,-1162
 910 DATA 0F,FE,02,38,29,28,05,CD,20,5B,18,CF,3A,7A,65,-1253
 920 DATA FE,4D,20,08,CD,8C,64,48,4C,00,18,C0,F5,3E,49,-1560
 930 DATA CD,D6,64,F1,CD,D6,64,18,B4,CD,8C,64,41,46,00,-2063
 940 DATA C9,CD,DA,65,18,A8,FE,CD,20,08,CD,5C,5B,CD,80,-2137
 950 DATA 5E,18,9C,FE,ED,CA,46,5D,7E,B7,CA,8B,60,23,47,-1982
 960 DATA C3,9E,5A,CD,5C,5B,F1,E6,38,0F,0F,0F,01,FE,50,-1738
 970 DATA 5B,CD,7C,64,CD,35,5C,CD,80,5E,C3,16,5F,CD,8C,-1954
 980 DATA 64,43,41,4C,4C,09,00,C9,CD,6B,5B,18,DF,CD,8C,-1589
 990 DATA 64,4A,50,09,00,C9,CD,81,5B,F1,E6,38,0F,0F,0F,-1461
1000 DATA CD,7C,64,18,D8,CD,8C,64,52,45,54,09,00,C9,F1,-1800
1010 DATA CB,5F,20,0B,CD,8C,64,50,4F,50,09,00,C3,F4,5A,-1563
1020 DATA FE,C9,20,05,CD,81,5B,18,B6,FE,D9,20,0A,CD,8C,-1981
1030 DATA 64,45,58,58,09,00,18,A8,FE,E9,20,10,CD,6B,5B,-1484
1040 DATA 3A,7A,65,FE,4D,CC,8D,65,C4,C9,65,18,94,CD,D6,-2147
1050 DATA 5B,CD,8C,64,53,50,2C,00,3E,02,CD,DA,65,18,83,-1486
1060 DATA CD,8C,64,4C,44,09,00,C9,F1,FE,CB,CA,97,5C,FE,-2196
1070 DATA C3,20,06,CD,6B,5B,C3,33,5B,FE,D3,20,18,CD,01,-1700
1080 DATA 5C,CD,21,5C,CD,35,5C,CD,2E,5C,C3,59,5B,CD,8C,-1835
1090 DATA 64,4F,55,54,09,00,C9,FE,DB,20,35,CD,19,5C,CD,-1643
1100 DATA 32,5C,CD,21,5C,18,E5,CD,8C,64,49,4E,09,00,C9,-1531
1110 DATA 3E,28,CD,D6,64,CD,86,5E,3E,29,C3,D6,64,3E,41,-1793
1120 DATA 18,F9,CD,2E,5C,3E,2C,18,F2,CD,7C,65,18,F7,CD,-1894
1130 DATA DA,65,18,F2,FE,F0,30,26,CD,5A,5C,CB,5F,01,FE,-2105
1140 DATA 4C,5C,20,14,CD,8C,64,28,53,50,29,2C,00,C3,05,-1153
1150 DATA 5B,CD,8C,64,45,58,09,00,C9,CD,8C,64,44,45,2C,-1529
1160 DATA 48,4C,00,18,0F,CB,5F,3E,44,28,01,3C,CD,D6,64,-1235
1170 DATA 3E,49,CD,D6,64,C3,13,5F,52,4C,43,52,52,43,52,-1501
1180 DATA 4C,20,52,52,20,53,4C,41,53,52,41,53,4C,4C,53,-1076
1190 DATA 52,4C,3A,7A,65,FE,4D,28,06,46,23,7E,70,2B,77,-1321
1200 DATA 7E,23,FE,40,30,28,F5,E6,38,0F,0F,0F,5F,87,83,-1504
1210 DATA 11,7F,5C,83,5F,30,01,14,06,03,1A,13,FE,20,C4,-1067
1220 DATA D6,64,10,F7,CD,A4,64,F1,E6,07,CD,7C,65,C3,16,-2171
1230 DATA 5F,FE,80,30,18,CD,8C,64,42,49,54,09,00,F5,E6,-1701
1240 DATA 38,0F,0F,0F,C6,30,CD,D6,64,CD,35,5C,18,DB,FE,-1713
1250 DATA C0,30,0A,CD,8C,64,52,45,53,09,00,18,E2,CD,8C,-1533
1260 DATA 64,53,45,54,09,00,18,D8,4C,44,49,20,43,50,49,-1054
1270 DATA 20,49,4E,49,20,4F,55,54,49,4C,44,44,20,43,50,-1000
1280 DATA 44,20,49,4E,44,20,4F,55,54,44,4C,44,49,52,43,-1033
1290 DATA 50,49,52,49,4E,49,52,4F,54,49,52,4C,44,44,52,-1153
1300 DATA 43,50,44,52,49,4E,44,52,4F,54,44,52,7E,B7,01,-1221
1310 DATA FE,48,5D,CA,8B,60,7E,23,47,FE,A0,36,16,D6,A0,-1954
1320 DATA CB,5F,28,02,D6,04,FE,08,38,02,D6,08,87,87,21,-1403
1330 DATA 06,5D,C3,03,5F,E6,07,CA,F7,5D,3D,CA,11,5E,3D,-1606
1340 DATA CA,25,5E,3D,CA,4D,5E,3D,20,0A,CD,8C,64,4E,45,-1462
1350 DATA 47,00,C3,13,5F,3D,20,14,CD,8C,64,52,45,54,00,-1173
1360 DATA CB,58,3E,4E,28,02,3E,49,CD,D6,64,18,E6,3D,20,-1474
1370 DATA 16,CD,8C,64,49,4D,00,78,06,30,FE,46,28,06,04,-1165
1380 DATA FE,56,28,01,04,78,18,E2,78,FE,67,30,26,CD,D6,-1737
1390 DATA 5B,CB,60,28,09,CD,32,5C,CD,D6,5D,C3,16,5F,CD,-1815
1400 DATA D6,5D,CD,35,5C,CD,2E,5C,18,F2,3E,49,CB,5F,28,-1739
1410 DATA 02,3E,52,C3,D6,64,CB,5F,20,09,CD,8C,64,52,52,-1603
1420 DATA 44,00,18,AD,CD,D6,64,52,4C,44,00,18,A4,CD,19,-1428
1430 DATA 5C,78,E6,38,0F,0F,0F,CD,39,5C,CD,09,5E,C3,16,-1422
1440 DATA 5F,CD,8C,64,28,43,29,00,C9,CD,01,5C,CD,09,5E,-1495
1450 DATA CD,35,5C,78,E6,38,0F,0F,0F,CD,7C,65,18,E1,CB,-1683
1460 DATA 58,28,09,CD,8C,64,41,44,43,00,18,07,CD,8C,64,-1258
1470 DATA 53,42,43,00,CD,8C,64,09,48,4C,2C,00,78,E6,30,-1260
1480 DATA 01,FE,44,5E,0F,0F,0F,0F,CD,DA,65,18,B9,CD,D6,-1629
1490 DATA 5B,CB,58,20,12,CD,75,5E,CD,35,5C,78,E6,30,0F,-1611
1500 DATA 0F,0F,0F,CD,DA,65,18,A0,78,E6,30,0F,0F,0F,0F,-1211
1510 DATA CD,3E,5C,CD,75,5E,18,91,3E,28,CD,D6,64,CD,80,-1898
1520 DATA 5E,C3,29,5C,23,7E,CD,BA,64,2B,7E,CD,BA,64,3E,-1796
1530 DATA 48,C3,D6,64,CD,4A,64,CD,A4,64,F5,D6,80,CD,A4,-2385
1540 DATA 5E,F1,E6,07,CD,7C,65,C3,16,5F,FE,20,D0,FE,18,-2086
1550 DATA 30,03,FE,10,D0,C3,32,5C,CB,77,CA,DA,5E,FE,76,-2074
1560 DATA 20,0C,CD,8C,64,48,41,4C,54,09,00,C3,16,5F,CD,-1312
1570 DATA D6,5B,F5,E6,38,0F,0F,0F,CD,39,5C,F1,E6,07,CD,-1918
1580 DATA 7C,65,18,E9,F5,E6,07,CA,2A,60,3D,CA,9A,5F,3D,-1877
1590 DATA CA,CB,5F,3D,CA,85,5F,3D,CA,77,5F,3D,CA,60,5F,-1922
1600 DATA 3D,CA,4F,5F,F1,E6,38,0F,0F,0F,87,87,21,2F,5F,-1454
1610 DATA 85,6F,30,01,24,06,04,7E,23,FE,20,C4,D6,64,10,-1312
1620 DATA F7,CD,A4,64,CD,A4,64,3A,F9,64,FE,29,DC,A4,64,-2371
1630 DATA 21,9B,60,7E,23,B7,CA,CF,64,CD,D6,64,18,F5,52,-2007
1640 DATA 4C,43,41,52,52,43,41,52,4C,41,20,52,52,41,20,-1020
1650 DATA 44,01,FE,40,5F,41,41,20,43,50,4C,20,53,43,46,-1119
1660 DATA 20,43,43,46,20,CD,D6,5B,F1,E6,38,0F,0F,0F,CD,-1555
1670 DATA 39,5C,CD,86,5E,18,B6,CD,6E,5F,F1,E6,38,0F,0F,-1755
1680 DATA 0F,CD,7C,65,18,A8,CD,8C,64,44,45,43,09,00,C9,-1496
1690 DATA CD,7C,5F,18,E7,CD,8C,64,49,4E,43,09,00,C9,F1,-1793
1700 DATA CB,5F,CC,7C,5F,C4,6E,5F,E6,30,0F,0F,0F,0F,CD,-1665
1710 DATA DA,65,C3,16,5F,F1,CB,5F,20,0F,CD,D6,5B,E6,30,-2005
1720 DATA 0F,0F,0F,0F,CD,3E,5C,C3,33,5B,CD,8C,64,41,44,-1334
1730 DATA 44,09,00,F5,3E,02,CD,DA,65,CD,35,5C,F1,E6,30,-1779
1740 DATA 0F,0F,0F,0F,CD,DA,65,18,13,CD,D6,5B,F1,47,FE,-1703
1750 DATA 20,30,29,CB,5F,28,09,CD,32,5C,CD,EC,5F,C3,16,-1568
1760 DATA 5F,CD,EC,5F,CD,35,5C,CD,2E,5C,18,F2,3E,28,CD,-1897
1770 DATA D6,64,AF,CB,60,28,01,3C,CD,DA,65,C3,29,5C,CB,-1944
1780 DATA 58,28,13,CB,67,20,07,3E,02,CD,3E,5C,18,03,CD,-1147
1790 DATA 32,5C,CD,75,5E,18,CA,CD,75,5E,CD,35,5C,CB,60,-1849
1800 DATA 28,07,3E,02,CD,DA,65,18,B9,CD,2E,5C,18,B4,F1,-1624
1810 DATA B7,20,0B,CD,8C,64,4E,4F,50,09,00,C3,16,5F,FE,-1483
1820 DATA 08,20,01,FE,3C,60,0F,CD,8C,64,45,58,09,41,46,-1212
1830 DATA 2C,41,46,27,00,18,EA,FE,10,20,21,CD,8C,64,44,-1324
1840 DATA 4A,4E,5A,09,00,C5,4E,06,00,CB,79,28,01,05,2A,-944
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Listing continued

Listing continued

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1850 DATA E5,60,09,C1,7C,CD,BA,64,7D,CD,87,5E,18,C5,CD,-2127
1860 DATA 8C,64,4A,52,09,00,FE,18,28,DD,D6,20,E6,38,0F,-1491
1870 DATA 0F,0F,CD,7C,64,CD,35,5C,18,CE,CD,8C,64,44,45,-1621
1880 DATA 46,42,09,00,2B,CD,86,5E,C3,16,5F,54,45,58,54,-1258
1890 DATA 2E,44,41,54,41,2E,3E,4D,32,7A,65,3E,48,32,D6,-1184
1900 DATA 65,3E,4C,32,D7,65,AF,32,B9,65,32,F9,64,4F,3A,-1652
1910 DATA 2C,63,B7,3E,01,32,2C,63,20,0D,2A,0F,61,3E,00,-843
1920 DATA 85,6F,30,01,24,22,E5,60,21,A0,60,11,9B,60,CD,-1450
1930 DATA F6,61,F6,01,32,2C,63,78,E5,21,00,00,2B,22,0F,-1257
1940 DATA 61,E1,FE,40,30,5D,E6,07,28,42,FE,01,28,45,FE,-1742
1950 DATA 02,28,4A,FE,06,38,07,FE,07,28,03,CD,F6,61,AF,-1466
1960 DATA 77,12,79,32,CB,60,21,00,00,7C,CD,BA,64,7D,CD,-1585
1970 DATA BA,64,CD,8C,64,20,20,00,21,A0,60,E5,41,7E,23,-1539
1980 DATA CD,BA,64,10,F9,CD,A4,64,CD,A4,64,E1,7E,47,23,-2151
1990 DATA C9,78,FE,01,FE,38,61,10,38,CC,18,C7,CB,58,20,-1805
2000 DATA C6,CD,F6,61,18,BE,78,FE,20,38,BC,18,F4,FE,C0,-2324
2010 DATA 38,B6,E6,07,FE,02,38,B0,FE,07,28,AC,FE,03,28,-1733
2020 DATA 1D,FE,05,38,DE,20,9F,78,FE,CD,28,D7,FE,ED,CA,-2284
2030 DATA 88,61,FE,DD,CA,07,62,FE,FD,CA,07,62,C3,07,61,-2128
2040 DATA 78,FE,C3,28,C0,FE,E3,DA,04,61,18,F1,CD,E4,61,-2396
2050 DATA FE,40,38,0C,FE,C0,30,08,FE,80,38,1A,FE,A0,30,-1814
2060 DATA 0B,78,32,0D,63,3E,01,32,06,63,18,D3,E6,07,FE,-1237
2070 DATA 04,30,EF,CD,F9,61,18,C8,FE,71,28,E6,FE,72,28,-2111
2080 DATA E2,E6,07,FE,03,38,ED,20,06,CD,F9,61,C3,41,61,-1959
2090 DATA FE,07,78,20,06,FE,77,38,DC,18,C9,FE,47,38,D6,-1888
2100 DATA FE,4D,28,D2,FE,56,28,CE,FE,5E,28,CA,18,B7,CD,-2169
2110 DATA 05,63,77,FE,20,38,04,FE,80,38,02,3E,2E,12,7E,-1261
2120 DATA 47,C9,CD,E4,61,78,23,13,0C,E5,2A,E5,60,23,22,-1653
2130 DATA E5,60,E1,C9,CB,6F,3E,58,28,01,3C,32,9B,65,32,-1672
2140 DATA C5,65,32,CE,65,32,7A,65,32,D7,65,3E,49,32,D6,-1693
2150 DATA 65,CD,E4,61,FE,CB,20,17,CD,F9,61,CD,F6,61,CD,-2447
2160 DATA F6,61,E6,07,01,FE,34,62,FE,06,28,05,3E,4D,32,-1479
2170 DATA 7A,65,C3,07,61,FE,C0,38,1A,FE,E1,28,11,FE,E3,-2067
2180 DATA 28,0D,FE,E5,28,09,FE,E9,28,05,FE,F9,C2,6C,62,-2020
2190 DATA CD,F9,61,18,DF,FE,80,38,19,E6,07,FE,04,38,04,-1816
2200 DATA FE,07,20,03,C3,9B,61,FE,06,38,E6,CD,F9,61,CD,-2045
2210 DATA F6,61,18,C2,FE,40,38,38,FE,66,28,0C,FE,6E,28,-1803
2220 DATA 08,FE,74,28,04,FE,75,20,03,32,B9,65,E6,07,FE,-1655
2230 DATA 04,38,04,FE,07,20,10,78,E6,38,FE,38,28,C9,78,-1450
2240 DATA E6,30,FE,30,28,C9,18,AD,FE,06,20,A9,78,FE,76,-1971
2250 DATA 28,B7,18,BC,E6,07,28,B1,FE,07,28,AD,FE,01,78,-1738
2260 DATA 20,15,FE,21,20,08,CD,F9,61,CD,F6,61,18,A6,E6,-1899
2270 DATA 09,FE,09,CA,59,62,18,93,FE,22,DA,6C,62,28,E8,-1816
2280 DATA FE,2A,28,E4,E6,38,FE,38,28,82,FE,30,78,28,0A,-1802
2290 DATA E6,07,FE,06,CA,73,62,C3,59,62,FE,34,DA,6C,62,-2024
2300 DATA FE,36,28,C6,C3,73,62,06,00,AF,32,06,63,B0,3E,-1528
2310 DATA 00,C0,3E,44,FE,44,28,16,D9,21,00,00,7C,B5,28,-1301
2320 DATA 52,2B,22,17,63,21,00,00,7E,23,22,22,63,D9,C9,-1060
2330 DATA 3E,01,B7,C8,E5,01,FE,30,63,3E,00,3D,32,31,63,-1398
2340 DATA CC,43,63,21,00,00,7E,23,22,3A,63,E1,C9,CD,2A,-1428
2350 DATA 64,FE,02,20,74,CD,2A,64,CD,8C,64,50,52,4F,47,-1608
2360 DATA 52,41,4D,20,45,4E,54,52,59,20,3D,20,00,CD,2A,-1030
2370 DATA 64,F5,CD,2A,64,CD,BA,64,F1,CD,87,5E,CD,CF,64,-2370
2380 DATA 3A,E7,64,21,55,59,22,E6,64,22,E9,64,B7,CC,9D,-1871
2390 DATA 59,CD,8C,64,41,4E,4F,54,48,45,52,20,44,49,53,-1319
2400 DATA 41,53,53,45,4D,42,4C,59,00,CD,18,5A,FE,59,CA,-1472
2410 DATA 98,56,21,00,00,31,00,00,C9,CD,4D,59,28,08,3A,-998
2420 DATA 40,38,E6,04,C8,18,BA,3E,65,EF,FD,CB,0A,46,18,-1726
2430 DATA F4,FE,07,28,10,FE,01,28,1E,CD,2A,64,47,CD,2A,-1551
2440 DATA 64,10,FB,C3,43,63,CD,CF,64,CD,8C,64,50,41,54,-1914
2450 DATA 43,48,2E,2E,2E,00,CD,CF,64,CD,2A,64,3D,3D,E5,-1487
2460 DATA D5,32,31,63,47,CD,2A,64,6F,CD,2A,64,67,ED,5B,-1718
2470 DATA E5,60,22,E5,60,A7,ED,52,D1,20,0F,E1,21,00,53,-1767
2480 DATA 22,3A,63,CD,2A,64,77,23,10,F9,C9,7C,B7,20,03,-1500
2490 DATA 7D,FE,03,D4,CF,64,30,01,AF,32,2C,63,B7,20,DE,-1755
2500 DATA E1,E1,18,DA,D9,2C,01,FE,2C,64,CC,81,59,7E,D9,-2117
2510 DATA C9,41,44,44,41,44,43,53,55,42,53,42,43,41,4E,-1195
2520 DATA 44,58,4F,52,4F,52,20,43,50,20,F5,E6,38,0F,0F,-1250
2530 DATA 0F,E5,C5,6F,87,85,21,32,64,85,6F,30,01,24,06,-1338
2540 DATA 03,7E,23,FE,20,C4,D6,64,10,F7,C1,E1,F1,C9,4E,-2161
2550 DATA 5A,20,5A,4E,43,20,43,50,4F,50,45,20,50,20,4D,-985
2560 DATA 87,F5,E5,C5,21,6C,64,85,6F,30,01,24,06,02,18,-1408
2570 DATA D3,E3,F5,7E,23,B7,28,09,FE,09,28,08,CD,D6,64,-1906
2580 DATA 18,F2,F1,E3,C9,CD,A4,64,18,EA,F5,C5,3A,F9,64,-2511
2590 DATA D6,08,30,FC,2F,3C,47,3E,20,CD,D6,64,10,FB,C1,-1773
2600 DATA F1,C9,F5,07,07,07,07,CD,C3,64,F1,E6,0F,FE,0A,-1965
2610 DATA 38,02,C6,07,C6,30,18,07,3E,20,CD,D6,64,3E,0D,-1228
2620 DATA C5,D5,F5,4F,CD,4D,59,28,79,CD,33,00,11,32,56,-1675
2630 DATA CD,55,59,CD,55,59,79,FE,0A,28,12,FE,0D,28,0E,-1522
2640 DATA FE,20,38,06,3E,00,3C,32,F9,64,F1,D1,C1,C9,3E,-1775
2650 DATA 16,3D,32,03,65,20,4B,3E,00,B7,28,08,47,3E,0A,-780
2660 DATA CD,D6,64,10,FB,3E,00,B7,20,34,2A,E9,64,E5,21,-1752
2670 DATA 55,59,22,E9,64,CD,8C,01,C8,28,65,64,0A,3D,20,-1431
2680 DATA 50,52,45,53,53,20,3C,45,4E,54,45,52,3E,20,54,-1049
2690 DATA 4F,20,43,4F,4E,54,49,4E,55,45,20,3D,20,00,E1,-1074
2700 DATA 22,E9,64,CD,C5,59,3E,16,32,03,65,AF,18,A3,3E,-1520
2710 DATA 02,EF,3A,E7,64,B7,20,06,11,32,56,3E,04,EF,3A,-1367
2720 DATA EA,64,B7,C2,EB,64,3E,06,EF,C3,EB,64,42,43,44,-2084
2730 DATA 45,48,4C,4D,41,E5,21,74,65,85,6F,30,01,24,7E,-1293
2740 DATA E1,FE,4D,38,19,20,09,CD,8C,64,28,48,4C,29,00,-1352
2750 DATA C9,CD,8C,64,28,49,58,2B,00,CD,86,5E,C3,29,5C,-1651
2760 DATA FE,48,DA,D6,64,C5,47,3A,7A,65,FE,4D,78,C1,CA,-2253
2770 DATA D6,64,32,C6,65,3E,00,B7,3A,C6,65,C2,D6,64,CD,-1978
2780 DATA 8C,64,49,58,4C,00,C9,CD,8C,64,28,49,58,29,00,-1365
2790 DATA C9,42,43,44,45,48,4C,53,50,E5,21,D2,65,87,85,-1623
2800 DATA 6F,30,01,24,7E,CD,D6,64,23,7E,E1,C3,D6,64,02,-1738
2810 DATA 02,64,56,-188,END
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End

Circle 107 on Reader Service card.

Join the Club

Computing at home can be a lonely experience. For instance, suppose you've splurged on a fancy new word processor, and you want to transfer your old word-processor files to it. The documentation suggests that it is possible, but nevertheless, the transfer fails.

The company's customer-service representative says to call the other company, which, unfortunately, is now out of business. It's just you against technology.

It was worse in the old days—about 10 years ago. If you bought software or hardware then, you didn't expect it to work, and you didn't expect much help from the vendor, either. Early computerists tended to seek each other out and draw on their collective experience to solve problems. Out of these gatherings grew the present network of computer clubs, or user groups.

A user group isn't for everyone, but if you have trouble getting what you need out of your computer, or just want to share your enthusiasm with other computerists, it might suit you.

Great Expectations

The size and quality of user groups vary. Some larger clubs boast thousands of members, a newsletter, a bulletin-board system (BBS) or two, and seminars on computer-related topics. Generally speaking, the larger the club, the more and better the services it offers its members.

Very large clubs tend to split the membership according to interests, such as Basic programming, interactive fiction, or applications. These clubs usually have sections for novice users, as well.

User groups of this size are usually in metropolitan areas. Fortunately, small clubs exist in many large towns and small cities. Small clubs are less formal, allowing more unstructured interaction among their members. This has its advantages: you learn about more areas of computing, and the atmosphere encourages members to bring up their own problems.

On the other hand, small user groups often publish no newsletter, offer fewer seminars, and sometimes don't have the resources to run a BBS. These are not big drawbacks if the club makes its members feel welcome and is serious about helping them out.

Where to Look

The local Radio Shack is your best bet to find a nearby user group. Computer Centers tend to be more aware of clubs and other resources that might interest their customers. With the franchise stores, your luck will depend on how much the manager cares about computers. Sometimes a franchise store will sponsor a user group.

Failing this, check non-Radio Shack computer stores. You probably won't find a Tandy-only club this way, but most MS-DOS-oriented clubs have a few 1000 owners among their members.

I had hoped to list at least a few user groups here, but I found that *80 Micro*'s list was too out of date. Nonetheless, drop me a note if you can't find a user group, as I'm in the process of updating the magazine's club listings (more on this later).

Starting Your Own

I don't recommend starting a user group only because you can't find a local one to join. It takes more than posting a notice at the Radio Shack. You must have something to offer, and I'm not talking about expertise with a computer.

You must be organized, persistent, responsible, and thick-skinned. Suppose you find a dozen or so people interested in joining your user group. You must make a good impression: Start the first meeting on time; spell out what you hope the user group will provide; keep the meeting flowing; and listen to what your would-be members say, even if they suggest something that doesn't appeal to you.

The following checklist should give you enough ideas to start a user group:

- If possible, ask a friend or two to help. Starting a user group is a big task.
- Make a list of objectives you want the user group to achieve. If you have your goals clearly defined in your mind, it will be easier to communicate them to a group.
- Outline how you see the user group being organized. How many officers? Will they be elected or appointed? What special-interest groups would you like to see? How will you keep in touch with members?
- Consider where you might want to hold meetings. Libraries, schools, and other public buildings often allow outside groups to hold meetings. They are usually easy to find and centrally located, as well.
- Give some thought to what dues should be charged. Will the user group have a newsletter? A BBS? Guest speakers? All these cost money, and a little footwork will get you rough estimates on just how much. Another user group, for

Illustration by Fred Schrier

instance, might be a good source of expense estimates.

- Speaking of other user groups, seek out a few outside of your area and ask their officers how they did it. They might even have members from your area who would join a user group closer to home.
- Draw up a proposed charter and have copies on hand for the first meeting.
- Post notices in Radio Shack stores, computer stores, shopping centers, and on any community bulletin boards. Be sure to ask permission from store managers. On your notice briefly describe what you want to do; ask those interested to either write or call you. You can set up a meeting once you have a list of prospective members.
- Keep in mind that all your plans are open for discussion once you've assembled your potential members. They probably won't agree with all your ideas, and they are sure to have a few of their own. Be open-minded and willing to accept what the majority wants.
- Ask those at the first meeting to fill out a questionnaire asking about their interests, areas of expertise, free times to meet, computer systems, and any tasks for which they would like to volunteer (such as a newsletter or BBS). Most importantly, get addresses and phone numbers.
- Finally, insist on a no-copying rule. Software copying is not as prevalent as it once was among user groups, but it still exists. Such a rule encourages a mature, responsible attitude among a club's members.

Some of you might want to add to this list. I welcome your comments and will mention them in this column.

Club Roundup

As I said, I'm compiling a user-group list. I want to hear from your club, especially if it is Tandy-specific. Send me the following information:

- club name and address;
- list of officers;
- name and phone number of contact person (optional);
- specific interests;
- dues charged;
- number of members;
- years in operation; and
- whether or not it publishes a newsletter or operates a BBS.

I would appreciate copies of user-group newsletters to keep on file, too.

I'd like The Home Computerist to act as a clearinghouse on user-group information for Tandy owners. So please keep me up to date on your user group.

Attention, Shoppers!

An interesting item crossed my desk recently. It's called *The Hardware Reference Guide for the Tandy 1000*, sold by Technetronics (P.O. Box 24299, Jacksonville, FL 32241, 904-262-2691, $6). It is a bargain-hunter's tip sheet for the latest prices on nearly every 1000 board you can think of—hard cards, modems, multifunction boards, clock/calendars, and oddball items.

The Hardware Reference Guide makes no attempt to evaluate any of the hardware. It just lists the vital statistics, price, and warranty information from each mail-order company. Technetronics claims to update it daily. A quick check on a few items seems to support that claim.

There just isn't any other way to get such current product information in one place.

I could not find Advanced Transducer Devices, maker of the Zuckerboards, listed under any category. Its products did appear under other dealers, though. Radio Shack dealers who discount Tandy equipment and magazines for the Tandy 1000 are listed in the back.

This is a unique product. There just isn't any other way to get such current product information in one place. If you are seriously shopping for Tandy 1000 hardware, *The Hardware Reference Guide* will more than pay for itself. By the way, Technetronics offers a discount to user groups on purchases of 10 or more guides: $3.50 each.

Next Month

A rash of on-screen tutorials on topics ranging from DOS to word processing have hit the market lately. In September, I'll check out a few, including one on Deskmate.■

Michael Nadeau is 80 Micro's executive editor. He has been editing computer magazines for six years, using Tandy equipment all the while. Write to him c/o 80 Micro, 80 Elm St., Peterborough, NH 03458.

CALL FOR ARTICLES

Have you written a program or utility that might be interesting to other *80 Micro* readers? Do you know a DOS or programming technique that you'd like to share? Then how about sending it in to *80 Micro* for possible publication?

We're looking for people with good ideas. In particular, we'd like to see some useful utilities, small-business and personal management programs, tutorials on Basic and Pascal programming for all levels of expertise, and interesting science, math, and hobby applications.

The procedure is simple. Write us a query letter telling us about your proposed article. We'll tell you whether we think your article is appropriate for *80 Micro*. We'll also send you a copy of our author's guidelines, which will give you information on manuscript preparation, style, payment rates, and the like.

Send your letter or proposal to:

Submissions Committee
80 Micro
80 Elm St.
Peterborough, NH 03458.

(No phone calls, please.)

Why Upgrade to DOS 3.2?

If you purchased a Tandy 1000 prior to release of the 1000 SX, you probably still have the MS-DOS 2.11 that came with your computer. Should you upgrade to the newer MS-DOS 3.2 now that it is available? I think so for several compelling reasons, and this month's column will explain them.

Tables 1 and 2 list the several new or modified commands in MS-DOS 3.2. Table 1 contains those features you can use from the DOS command prompt, and Table 2 is a list of the new features that you can specify in your system's configuration file.

Most of these commands benefit the hard-disk user most, and, if you have installed a hard-disk card in your Tandy 1000, this is another excellent reason to upgrade to DOS 3.2. Most hard cards available for the Tandy 1000 have a capacity of at least 20 megabytes (MB). Under DOS versions prior to release 3, the best you could hope for was allocations of 8K for each cluster on a disk up to 32MB in size.

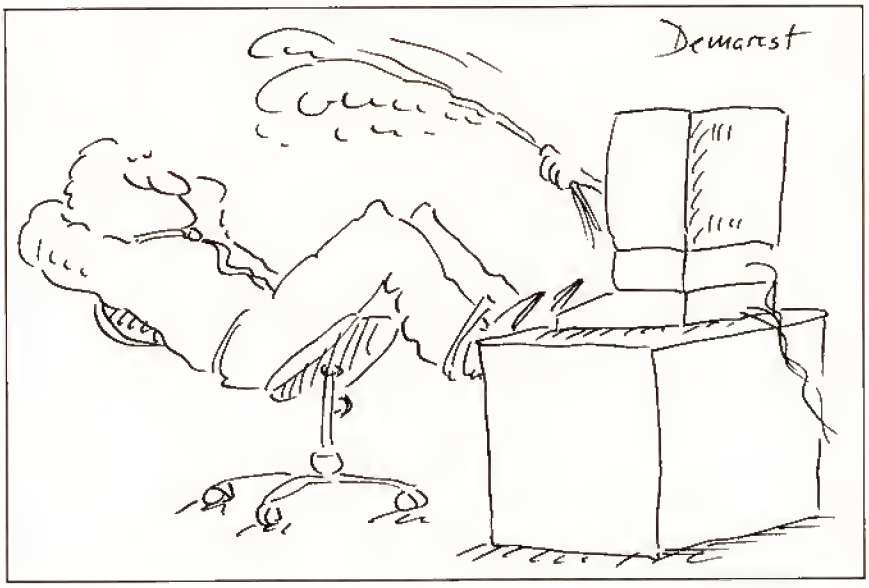
This means that any file you store on the disk uses at least 8,192 bytes. Statistically, you can show that you waste about 4,096 bytes in the last cluster of each file—quite a bit of wasted space. Beginning with DOS 3.0, the hard-disk file handling has expanded to more efficiently use the larger hard-disk volumes.

The cluster size changes from 8,192 to 2,048 bytes when you use DOS 3.2 on a 20MB hard disk. This cuts the average wasted space down to 1,024 bytes per file. I found that I was able to reclaim over 1MB of space once I switched to DOS 3.2 and reloaded Graphwriter, which consists of about 300 files, many of them less than 4,096 bytes.

You do not gain all this free space without some pain—you have to make a complete backup of your hard disk and then reformat it using the newer DOS version. After that you must restore all the files.

DOS 3.2 also changes the file-allocation algorithm on the disk. In previous versions, DOS allocates file space using the first available cluster on the disk. Long periods of use with numerous file deletions and creations cause the disk to become severely fragmented.

As a result, all clusters for a file might not occupy adjacent areas on the disk, which substantially slows file access. DOS 3.2 improves the file-allocation algorithm in an attempt to budget disk space more efficiently. I have found this file-allocation scheme to be a significant improvement over the older one, especially on a large hard-disk system.



DOS 3.2 has some significant additions that improve its performance (see Table 1). A complete software industry exists to provide simple tools that do tasks now provided for by this new 3.2 DOS.

The Append command lets you create a data-file path that tells DOS which drives and subdirectories to search

DOS 3.2 command	Description
Append	set a data-file path
ATTRIB	set or display file attributes
Diskcopy	make copies of floppy disks
Disktype	display information about disk
Format	prepare disks for system use
HSect	low-level preparation of hard disk
Join	link root directory to a path name
KEYBxx	substitute international keyboard BIOS
MLFormat	format second DOS partition on hard drive
MLPart	create second DOS partition on hard drive
Mode	set peripheral/system parameters
Patch	make modifications to disk file
Print	manipulate background print queue
Replace	update previous versions of files
Setup	initialize (AT) system configuration
Share	install file-networking functions
Shiptrak	park hard-disk heads prior to S/D
Spooler	operate the DOS printer spooler
SUBST	substitute drive name for path
XCopy	copy files/directories

Table 1. MS-DOS 3.2 commands.

Illustration by Chris Demarest

when looking for a data file. This has been one of DOS's most serious limitations—the inability to keep your data files in a subdirectory separate from the main program files. DOS uses the Path command search for program-executable files but does not search along this path for data files, and many of the older software products did not use the nested directory features.

The ATTRIB Command

The ATTRIB command lets you modify the "read-only" and "archive" bits of a specified file. Changing the archive attribute is particularly useful when coupled with the Backup, Restore, and XCopy commands. Selectively setting or clearing the attributes for your files allows you to exercise greater control over these utilities when they examine this bit to determine whether a file has been modified.

Diskcopy now accommodates the newer format disks and automatically recognizes the need for target-disk formatting prior to copying the source. Previously, you had to format your target disks before doing the copy. This is a welcome improvement that reduces the need for other disk utilities.

The new Format command has two significant changes other than support for the new disk formats. You cannot format a disk without explicitly specifying the target-drive letter on the command line. This means that you no longer have to worry about formatting the wrong disk because you omitted the drive letter.

More importantly, you cannot format the hard-disk drive without entering the volume label. If you do not enter the correct label, the command aborts. I take advantage of this in my office by putting a non-printing (FF hexadecimal) character into my volume label. You can't see it and you can't enter it unless you know how to type it using the alternate key and the numeric keypad.

The KEYBxx Routines

The KEYBxx routines that began with DOS 3.0 are basic input/output system (BIOS) keyboard extensions for multilingual support. The Label command creates, changes, or deletes the volume label on the target disk drive.

MLFormat, MLPart, and the driver MLPart.SYS are specialized support utilities for partitioning a hard disk into multiple DOS volumes. The current DOS version cannot use more than 32MB of a hard disk without resorting to some devious scheme. You also cannot use the FDisk command to partition the hard disk into multiple DOS volumes to use the remaining space.

Several alternatives exist for creating immense data-storage devices and using them with DOS. These three routines provide one of these mechanisms and let you create additional partitions up to 32MB each. You can place up to three more partitions on your hard disk so you can accommodate drives as large as 128MB.

The ATTRIB command lets you modify the 'read-only' and 'archive' bits of a specified file.

The Patch command does not exist in other MS/PC-DOS 3.2 implementations and appears to be a Tandy utility. It lets you make minor changes to programs or any other disk file if you know the location of the bytes you want to change and if the replacement data is the same length as the original data. Tandy promises program changes using this utility.

The Print command now accepts the device name on the command line. More importantly, you can now set the buffer size and the number of files allowed in the print queue. Changing the size of the print buffer significantly speeds up the background file-printing operation.

Do not confuse the Print command with the Spooler command, which is a true printer spooler. Print takes previously prepared output and processes the files in the background while you perform other tasks. Spooler works in conjunction with Spooler.SYS and directly intercepts calls to write data to a printer. It stores the data in memory and prints it whenever the printer is available. This operation is transparent to your program and requires minimal intervention after installation.

Join, SUBST, Replace, and XCopy are sophisticated file-management utilities that are well-suited for the DOS environment. The Join command links the root directory of the target disk to a path name. It removes the distinction between physical drive units that you must refer to by separate drive letters. For example, JOIN A: C:\DATA joins the disk in drive A to the subdirectory \DATA on your hard disk. Any subsequent reference to this directory automatically refers to the root directory of the disk located in drive A.

The SUBST command is essentially the reverse. It lets you assign a shortcut drive-letter notation to any disk path name. If you are using a deeply nested directory structure on a hard disk, this can be a time-saver.

As an example, my C source-code files are in \Language\MSC\Source, and typing this every time I want to change directories is tedious. I use the command SUBST E: C:\LANGUAGE\MSC\SOURCE to denote that "E:" is a shortcut for the full path name.

Have you ever wanted to update the files on your disk to a new version of software? How about adding files that do not exist on the hard disk? Batch files can accomplish these tasks, but they have limitations. First, you cannot easily search every subdirectory of a hard disk by using a batch file. You also cannot use a batch command to selectively update files if the source files are newer.

The Solution

Replace solves all these problems. By default, it sweeps through the target directory and replaces any files that match the source directory. You can add files that do

Config command	Description
Country	establish international conversions
Drivparm	define parameters for block devices
FCBS	specify maximum file-control blocks
Lastdrive	define the maximum number of drives

Device driver	Description
Driver.SYS	extended disk support
HDrive.SYS	extended hard-disk support
LPDRVR.SYS	extended printer support
MLPart.SYS	access multiple DOS volumes
Spooler.SYS	printer spooler driver
VDisk.SYS	virtual-disk-device driver

Table 2. MS-DOS 3.2 features available for your system's configuration file.

not currently exist in the target directory, or you can cause Replace to scan all directories on the target drive. Other options select replacement if the date is more recent, pause for permission to replace, and replace read-only files.

XCopy is a superior extension of the Copy command. It copies files or directories from the source disk to the target disk, duplicating the source directory structure as it copies. Unlike Diskcopy, XCopy does not require that the source and target disks have identical formats.

Optional parameters for this command allow copying only files that have the archive bit set, and you can leave the archive bit as is or reset it after a successful copy. You can copy files modified on or after a specified date. One option lets you duplicate the directory structure of the source disk completely by allocating empty directories on the target disk matching the source's structure.

You can use XCopy to make an exhaustive backup of your disk that stores all the files in a ready-to-use format (unlike the Backup command). Use ATTRIB or a utility package like the Norton Utilities to set all the archive attributes on the disk. Then prepare a stack of formatted, blank disks large enough to hold all the files.

Next, issue the command XCOPY C:\ A:\ /S/M. This instructs XCopy to copy all the files from drive C to A, search through all subdirectories on drive C, and copy only modified files, resetting the archive bit after the copy. XCopy fills up the first disk and then stops with an "Insufficient disk space" error message.

Xcopy makes an exhaustive backup of your disk that stores the files in a ready-to-use format.

Replace the disk and press the F3 key to restore the command line; then press enter. XCopy again starts searching with the root directory on drive C, but it skips all the previously copied files because the archive bit has been reset. Continue to fill disks until XCopy no longer reports an error on the copy. You now have a full backup of your disk with the exception of hidden or system files.

Conclusion

DOS 3.2 is a significant change from the previous versions—especially from the version distributed with the older Tandy 1000. I think you will find it well worth the upgrade. If you are a hard-disk owner, I recommend that you upgrade now and make the one-time effort to reformat your disk. Make sure you remember how much memory you had used before you start the process and you will be surprised with how much additional space you gain after completing the upgrade.

However, if you have a minimal Tandy 1000 configuration, this DOS release might not be for you. Tandy 1000 owners with 256K of memory are already tight on space, and 3.2 is significantly larger than its predecessor.■

John B. Harrell III is a naval electronic warfare systems analyst. He programs in Pascal, C, and assembly language. Write to him c/o 80 Micro, 80 Elm St., Peterborough, NH 03458.

BBS Etiquette

Illustration by Bob Eckstein

Last month, I told you what equipment and software you need to access electronic bulletin-board systems (BBSes) and download public-domain software. With that sole objective in mind, however, you will surely not win friends. System operators (sysops) set up BBSes for both your enjoyment and theirs. They are inviting you to participate in their hobby, and you should follow certain rules of etiquette if you accept the invitation.

Suppose you are invited to a party. You go to the host's house, search around for the hors d'oeuvres, eat as many as you can, stick a few more in your pocket, and then leave without even conversing with your host or the other guests. Or suppose you introduce yourself using a false name. Do you think your host will be anxious to see you come back?

Unfortunately, this happens time after time to sysops. They invite you into their homes via the telephone, and you should give them the same type of respect as if you were a guest in their living rooms. You should participate in the BBS conversations and not just download public-domain software, hanging up without even a thank-you.

The sysop is there because it is his pleasure and expense. Once his pleasure stops, so does yours. He can pull the plug on you if you don't abide by his rules and standards. If you don't like something, you can either discuss it with the sysop or leave. Keep your discussion friendly and private unless the sysop decides to open it up for others. Sysops are usually fair. If there is a legitimate concern, he might change the rules. Usually, you will find that the other BBS users support the sysop.

What Is Expected of You

A sysop generally wants to know who you are, your interests, and what he can do to help you. Your behavior on his board tells the sysop whether you intend to contribute to the discussions or upload new public-domain software in exchange for what you have taken.

Some BBSes are single purpose, while others have conferences on numerous topics. I've been on a BBS set up to assist in tax matters only. I've also been on one that had close to 30 conferences covering a range of computer topics plus subjects such as astrology, adults only, and gay rights. Sysops must exercise special control over some topics to ensure that their BBSes, and BBSes in general, don't get a bad rap by allowing undesirable situations to occur. For example, you wouldn't want your children to have access to adult topics.

The First Time

When you first get on a BBS, you are expected to give your correct name. Some BBSes let you use an alias; most do not. Most sysops and BBS users want to know exactly who they are talking to and feel that aliases encourage people to say things they aren't brave enough to say under their true names.

Next, you will probably get a list of rules. You might be told to read certain bulletins and how to access them. These bulletins might tell you what is expected of you in return for downloading files, what types of public-domain programs the BBS is looking for, whether uploaded files should be in a compressed format, or the user-supported aspects of the BBS. More on user support later.

You will often be asked to fill out a questionnaire, usually asking for your name, address, telephone number, age, and why you want to access the BBS. The sysop will verify your identity either by checking the phone book or calling you. Giving false information is against federal law.

Once you've read the bulletins and filled out the questionnaire, the sysop will give you access to all the open areas of the BBS, including the download sections in most cases. This usually takes 24 hours.

Sysops' Pet Peeves

The biggest pet peeve of sysops is not reading the bulletins or filling out the questionnaire. The next in importance is not keeping within an upload/download ratio or uploading junk and copyrighted programs just to keep up the ratio. Some users have uploaded copies of MS-DOS utilities such as Debug or have renamed a program that the BBS already has. All BBS activities are logged, and attempting an undesirable practice such as these usually gets the perpetrator "locked out" of the BBS. The following list tells you how to stay on a sysop's good side:

- Do not use aliases unless specifically encouraged by the sysop.
- Do not put misleading or false information on BBS questionnaires.
- Read the sysop's bulletins.
- Don't download software without contributing to the message base. Become a member of the BBS community.
- Respect upload/download ratios. Don't

just download without contributing your public-domain programs.

- Don't act as if it is your right to use the BBS.
- Don't demand that the sysop do things differently.
- Don't expect more access time without following the BBS rules.
- Don't complain obnoxiously, though constructive criticism is acceptable.
- Don't use foul language.
- Don't enter messages in uppercase. It looks like you are shouting, and it is hard to read.

I know of one sysop who takes great glee in his traditional announcement of Permanent Twits—those who don't follow the rules and are banished from his BBS forever. Following is text for one who was "Twitted." The names have been changed to protect the guilty:

> John Doe, one of the oldest American traditions is the public announcement. It serves to "place the case in the court of public opinion." I publicly declare those who have become Permanently Twitted for a few reasons, chiefly because they rarely look in the message area, and as you discovered, those Twitted are not displayable when others search the user list. It's possible that John Smith may be an acquaintance of yours, and, if so, please discuss BBS etiquette with him. It's too late here, but you may save him the "grief" from other Sysops with thicker skin than mine.

The User-Supported BBS

Like user-supported software, many BBSes ask for donations. The donations are not for using the message bases, but for extra downloading privileges. Using the message bases are usually free regardless of other donations asked. Remember that for most sysops, their BBSes are their hobby. The donations allow them to continue with it.

Most boards offer two alternatives for downloading. If you want unlimited downloading privileges, you can donate the required fee, usually $10 to $25 a year, and never again worry about being criticized for excessive downloading. Some ask for a one-time-only contribution of $25 or $35.

If you don't care to contribute, you can keep an upload/download ratio, usually one upload for every 20 to 30 downloads. If you have less than that ratio, your access time is decreased to the point where you can't effectively download until you contribute a few upload files. When uploading, the access-time clock is usually stopped.

Some BBSes demand a payment for downloading privileges, though use of the message base is free. I do not care for this arrangement, since it inhibits those who can't afford to pay from downloading. My main argument, though, is that it gives no incentive for anyone to upload files, and thus the BBS's file selection stagnates.

This is not exactly borne out in practice. I counted the number of uploaded files over a three-month period to a pay-only BBS and to three other BBSes with alternative pay or ratio plans. Though the alternative-plan BBSes had slightly more uploads over the same period, the difference wasn't great. The quality of uploads to any of the BBSes was about equal. You don't get any better files on a pay-only BBS.

The pay-only sysop argues that since he has a closed system of users for uploads and downloads, the chance for getting Trojan files from the BBS is decreased significantly. A Trojan file is one that someone has altered to destroy data on your floppy or hard disk when you run it. Most sysops check out files before releasing them for access by the users. Many users volunteer to check out the files, and sysops give them special access to the beta files. The sysops of pay-only BBSes can also afford to upgrade their equipment more readily.

Given the choice, most users opt for the download/upload ratio to maintain access.

Given the choice, most users seem to opt for the upload/download ratio to maintain their access. One of the best BBSes that I access gives the users an option of paying or not. I was surprised to find out that during the three-month period that the sysop actively solicited contributions, he had only 13 supporting users at $25 each. Even with that he upgraded to a multitasking, multiuser system with two phone lines. Supporting users, now 15, have full exclusive access to the second node (phone line), while all other users must use the first node. Some pay-only BBSes state that they will put on an additional phone line for each 100 paying users.

Paying $25 a year for downloads is still far cheaper than paying for Compuserve, The Source, Genie, or Delphi access—the major commercial data-base networks who charge up to $12.50 per hour.

Model 100 Update

Last month, I eliminated discussion about Model 100 terminal programs because of lack of space. The Model 100 comes with its own terminal program. Telcom can only upload and download straight ASCII programs (document files), even with special programs for error-free transfer like SXM.BA. You must change Basic programs to DO format before transferring them. This is easy enough; just load your program into Basic and type SAVE "filespec.DO", where filespec is the name of your Basic program. You can convert machine-language programs (with the CO extension) to an ASCII/hex format with a program like Change.BA, which I discussed in the March 1987 column (p. 90).

Correction

In the March and April Public Works, I talked about Club 100 and the Danville Tigers Club in practically the same breath. Since they both have the same public-domain software for the Model 100, many readers have been writing to the Danville Tigers Club for information on its software. All distribution of public-domain software for these groups is through Club 100. Contact Hanson-McBride Services/Club 100, P.O. Box 23438, Pleasant Hill, CA 94523, for information on Model 100 public-domain software. For those who have written to Bill Templeton, your letters have been forwarded to Club 100. You will still get information, but expect a delay.

Next Month

I'll get back to public-domain software next month and talk about hard-disk utilities. I'll also try to to feature a BBS or two from around the country. Send me the name, city, state, phone number, and the computers supported on your favorite BBS.

Model 100 users can send $6 for a 3½-inch disk with SXM.BA, Change.BA, their DOC files, and other public-domain selections. If you prefer the software on a 5¼-inch TRSDOS 1.3 or MS-DOS disk that you can download to your 100 using a null-modem cable, I will send the disk I mentioned in my March column. I'll even make a tape for $6, though I make no guarantees. No special requests please; it's too hard to keep track of them. Please send your questions separately from disk requests. ■

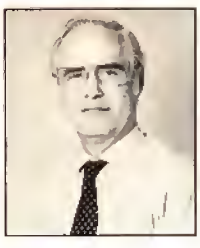


Photo by Richard Quindry

Thomas Quindry has written for 80 Micro since 1980. Write Tom at 6237 Windward Drive, Burke, VA 22015. Enclose a stamped, self-addressed envelope for a reply.

How to Use *80 Micro* Program Listings

Basic program listings in *80 Micro* include a checksum value at the end of each line. This value is the sum of the ASCII values of all characters and spaces in the line, excluding remarks. You can use these values to test the accuracy of your typing.

- Type in program code *exactly* as listed, omitting the indentations (when program lines continue to a second or third magazine line). The '* characters, checksum values, and comments may be omitted.
- Save the program in ASCII format with the command SAVE "file name",A.
- Load and run Checksum (see Program Listing). (For the Tandy 1000, change line 10 to: 10 CLS:LOCATE 2,25:PRINT "VERIFY CHECKSUMS ON PROGRAM" '* 3544.) The program will prompt you for the name of the file to be verified and give you the option of sending the line numbers and checksum values to the printer or to the screen.

When printing to the screen, Checksum lists 20 lines and then waits for you to press the enter key.

- Compare the displayed line numbers and checksum values with the checksums shown in the listing. Correct errors in lines having checksum values that don't match.

—Beverly Woodbury,
Technical Editor

Program Listing. Checksum.

```
10 CLEAR 1000:CLS:PRINT@140,"VERIFY CHECKSUMS ON PROGRAM"          '*  3713
20 PRINT:PRINT:INPUT "Enter Name of File to verify";F$             '*  4245
30 PRINT:PRINT:PRINT "List Checksums to:"                          '*  3233
40 PRINT TAB(20) "<P>rinter":PRINT TAB(20) "<S>creen"              '*  3628
50 PRINT:PRINT:PRINT TAB(30);"? ";                                 '*  2148
60 K$=INKEY$                                                       '*   726
70 IF K$="P" OR K$="p" OR K$="S" OR K$="s" THEN 80 ELSE 60         '*  3269
80 PRINT K$:IF K$="P" OR K$="p" THEN LP=1                          '*  2439
90 OPEN "I",1,F$:B$=CHR$(34)                                       '*  1521
100 IF EOF(1) THEN CLOSE:GOTO 390                                  '*  2000
110 LINE INPUT#1,L$:L=VAL(LEFT$(L$,6))                             '*  2275
120 IF Z=2 AND L=0 THEN 100 ELSE Z=2                               '*  2089
130 A=VARPTR(L$):GOSUB 270:Q=PEEK(A)                               '*  2244
140 LS=PEEK(A+1):MS=PEEK(A+2):A=MS*256+LS:GOSUB 270                '*  3115
150 IF INSTR(L$,"'") THEN GOSUB 280                                '*  2038
160 IF RIGHT$(L$,1)=" " THEN IQ=Q:GOSUB 370                        '*  2514
170 FOR K=1 TO Q:P=PEEK(A):CS=CS+P:A=A+1:NEXT K                    '*  2945
180 IF CS=0 THEN 100                                               '*  1131
190 IF CS<100000! THEN D$="-"                                      '*  1538
200 IF CS<10000 THEN D$="- "                                       '*  1481
210 IF CS<1000 THEN D$="-  "                                       '*  1466
220 IF CS<100 THEN D$="-   "                                       '*  1451
230 IF LP=1 THEN LPRINT "Line";L;D$;CS,:CS=0:GOTO 100              '*  3370
240 PRINT "Line";L;D$;CS:CS=0:X=X+1                                '*  2282
250 IF X=20 THEN X=0:PRINT TAB(30) "Press <ENTER> to continue."
    ELSE 100                                                       '*  4924
260 K$=INKEY$:IF K$<>CHR$(13) THEN 260 ELSE 100                    '*  2705
270 IF A>32767 THEN A=(65536!-A)*-1:RETURN:ELSE RETURN             '*  3275
280 I=INSTR(L$,"'"):IQ=I-1                                         '*  1504
290 IF LEN(L$)=INSTR(L$,"'") THEN 100                              '*  2095
300 LQ$=STR$(L):LQ=LEN(LQ$):IF LQ+2=>I THEN 100                    '*  2839
310 Q1=INSTR(L$,B$):IF Q1>I OR Q1=0 THEN 370                       '*  2593
320 Q2=INSTR(Q1+1,L$,B$):IF Q2>I THEN I=INSTR(Q2,L$,"'")           '*  3297
330 IF I=0 THEN RETURN                                             '*  1386
340 Q3=INSTR(Q2+1,L$,B$):IF Q3>I OR Q3=0 THEN 370                  '*  2869
350 Q4=INSTR(Q3+1,L$,B$):IF Q4>I THEN I=INSTR(Q4,L$,"'")           '*  3308
360 IF I=0 THEN RETURN                                             '*  1389
370 FOR I=IQ TO 1 STEP-1:C=ASC(MID$(L$,I,1)):IF C<33 THEN NEXT I   '*  3847
380 RL$=LEFT$(L$,I):Q=LEN(RL$):RETURN                              '*  2323
390 PRINT:PRINT"CHECKSUM/BAS now in Memory"                        '*  3248
400 PRINT "Reload the PROGRAM that you are working on? (Y/N)";     '*  4890
410 INPUT Q$:IF Q$="Y" OR Q$="y" THEN CLS:LOAD F$                  '*  2967
```

End

80 MICRO'S LIST of ADVERTISERS

AUGUST 1987

Pop Quiz Participant.

For more details about our Pop Quiz turn to page 54.

Upgrading to MS-DOS?

LET'S GET SERIOUS.

THE COMPUTER WITH A FUNNY NAME...

THE CLONE™

Frankly, this is the best computer value in America. Better than IBM. Better than Tandy. Complete MS-DOS™ compatibility. . .lightning fast processing. . .tons of RAM. This machine has everything the Boys in Blue promise. . .and more. All at a price you can afford.

WE DIDN'T NAME IT "CLONE" FOR NOTHING.
What we have here is a computer that is truly IBM PC/XT compatible. The Clone computer is completely MS-DOS compatible and it has all the hardware capability of the IBM PC/XT (except cassette) plus some and comes with MS-DOS 3.2 (the latest version), GW-BASIC and reference manuals (manuals are extra cost on the Tandy 1000!). With the Clone you get eight IBM compatible expansion slots, seven of them a full 13" long. You have six additional slots available; something a Tandy 1000 owner can only dream about.

IBM COMPATIBLE? YOU BET.
Flight Simulator, one of the classic tests of compatibility, runs perfectly. Lotus 1-2-3® can't tell it's not running on an IBM. In fact, we have not discovered an off-the-shelf MS-DOS software package that wouldn't run properly on the Clone. The ability to run standard, off-the-shelf, software is important because it allows you to obtain software from any number of sources.

STANDARD FEATURES:
The Clone computer comes complete, ready to run, with lots of standard features. Like the maximum 640K of system memory installed. Like an IBM standard parallel printer port, a clock/calendar with automatic battery backup, a speaker, two serial ports (one populated), a game adapter/joystick port, a light pen port, a 2-drive floppy disk controller, and the newest AT style keyboard. The video output is IBM standard color graphics with a special port that allows you to view color software on a monochrome monitor as well as 80 x 25 text. A 360K ultra-reliable floppy drive is included with space for three additional half-height floppy or hard disk drives. The 135 Watt power supply runs cool and assures you of adequate power for future expansion.
PC-DeskMates, a powerful multi-function memory resident utility, is included so you can start using the Clone when you receive it. You get an alarm, clock, calculator, calendar, notepad, phone dialer, typewriter, and access to DOS level commands. The Clone also comes with Qmodem, the famous modem program which enables you to access the world of telecommunications. PC-Write, probably the best shareware word processor available, is also furnished. Your Clone comes ready to work for you.

WHAT'S MISSING?
The Big Blue price tag.

. For serious users only.

OPTIONAL FEATURES:
The Turbo Clone is equipped to run at the standard 4.77mHz clock rate or at a blazing 8mHz. That's almost 70% faster processing than a standard IBM. Front panel lights indicate Turbo operation, power status and hard disk activity. A key-lock switch allows the keyboard to be electrically "locked out" for unattended security. Imagine a lengthy Lotus 1-2-3 spreadsheet recalculation with an 8mHz processor! It's awesome.

HOW TO BUY A COMPUTER WITHOUT LEAVING YOUR CHAIR.
Zero effort required. Just pick up your phone and call us toll-free.

Clone equipped with all standard features.
(Keyboard and monitor included) $699

Your American Express, MasterCard and Visa are welcome at no extra charge as well as your check, money order, or COD order. Your Clone ships right away. In just a few days the UPS man delivers it to your door.

Too long to wait? Ask for our Expedited Service. Our distribution experts will get you a Clone OVER-NIGHT, almost anywhere. (Some restrictions apply).

A WORD OF EXPLANATION.
We sell Clones exclusively by mail. And there's a good reason why. Supporting the expensive overhead of a chain of retail stores is not our idea of keeping costs down. You're buying the Clone computer at wholesale prices, directly from the manufacturer. Your Clone comes with an ironclad guarantee that exceeds most other manufacturers'. We guarantee your satisfaction or we'll refund your purchase price within thirty days, no questions asked. Our guarantee is backed by a reputation earned in years of experience in the mail order business. Think about it. Repeat orders come from satisfied customers. This makes us work very hard to get it right the first time.

Optional TURBO Clone. $799

Circle 302 on Reader Service card.

Circle 302 on Reader Service card.

US VS. THEM

FEATURES	CLONE	IBM PC/XT	TANDY 1000 EX (SX)	LEADING EDGE Model D
Microprocessor: Intel 8088 @ 4.77mHz	YES	YES	YES	YES
	8mHz Optional	NO	7.16mHz STD	NO
Power Supply Rating	150 WATT	63.5 WATT	54 WATT	130 WATT
IBM Standard Bus:	YES	YES	NO	YES
Operating System:	MS-DOS 3.2	EXTRA	MS-DOS 2.11 (3.2)	MS-DOS 3.1
Disk BASIC:	YES	IN ROM	YES	YES
MS-DOS and BASIC Ref. manuals:	YES	EXTRA	EXTRA	YES
Standard System RAM:	640K	256K	256K (384K)	512K
Cost to Expand RAM:	-0-	$$	$259 ($129)	$
Keyboard:	'AT' STYLE	STD	NON-STD	STD
Video Monitor: (composite)	INCLUDED	EXTRA	EXTRA	INCLUDED
Video Outputs:	BW/NTSC/RGB	EXTRA	NTSC, RGB	B/W, RGB
Disk Drive Capacity:	1-360K	1-360K	1-360K (2-360K)	2-360K
Max Number of Internal Drives:	4	4	1 (2)	2
Internal Expansion Slots:	8	5	1 (5)	4
Accepts Standard IBM Cards:	YES	YES	NO (10" Only)	YES
8087 Math Co-Processor Option:	YES	YES	NO (YES)	YES
Sturdy Steel Case:	YES	YES	PLASTIC	PLASTIC
Standard Parallel Ports:	1	0	1	1
Standard Joystick and Light Pen Ports:	YES	NO	J (J/LP)	NO
Standard Serial Ports:	2 (1 Optional)	0	0	1
Warranty	1 YEAR	90 DAYS	90 DAYS	15 MONTHS
Clock/Calendar	YES	NO	NO	YES
Cost Ready-to-Run	$699	$3,063	$1,398 + ($1,683 +)	$1,295
8mHz Option	$799			

Add $35 for ground delivery; $70 for air.

IBM XT cost figures*: Video Display Adapter $250; Video Display $275; IBM XT computer $2,145; Additional Ports, serial port, game port, parallel port, 640K RAM $308; DOS 3.2 and BASIC $85; Total $3,063. Does not include the battery back-up clock calendar. No light pen port.

*The above prices are list prices as best we could determine. Both the IBM and Tandy are available at a discount.
Tandy 1000 cost figures*: DOS 2.11 and BASIC reference manuals $29 +; Memory Plus Expansion Board (to 384K) $129 +; 256K Additional RAM $129 +; One serial Port $79 +; Battery Back-up Clock Calendar $99 +; Composite Monochrome Monitor $129 +; Model 1000 EX Computer $799; Model 1000 SX Computer $1199; We were not able to equip the Tandy 1000 to directly compare with the Clone because of the 1000's inherent design limitations.

NO ORPHANED CUSTOMERS

We have been supplying serious customers with high quality hardware and software since 1980. Sound engineering, high performance, quality construction, outstanding warranties and a reputation for doing the right thing have been our way of doing business since Day One. As the manufacturer of Clone computers, we stand behind each computer sold with a 100% commitment to our customers' satisfaction. Price, Performance, Value... Clone is the clear choice for serious computer users. To order, call us today.

REMEMBER. . .YOUR BEST FRIEND MAY BE A CLONE!

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NX-10 120/30cps NLQ $180*
NX-15 Wide carriage $299*
ND 10 180/45cps NLQ $299*
ND-15 Wide carriage $399*
NR-15 240/60cps NLQ $499*
NB-15 300/100cps NLQ $799*
NB24-15 216/72 NLQ $699*
10' Printer cable $12*
*With purchase of our computer.

FLOPPY DRIVES

36K 5.25" half-high $99
720K 3.5" TEAC $149
External case for above $59
External drive cable $39

TAPE BACKUP

10MB Internal tape unit $299
20MB Internal tape unit $399
40MB Internal tape unit $499
20MB External tape unit $449

MODEMS

300/1200 baud Everex with software $99
300/1200/2400 baud Everex with software $199

MICE

Microsoft Serial Mouse $125
Microsoft Bus Mouse $115
TAC 1+ Joystick $21

HARD DRIVES

20MB Seagate 65ms kit $329
30MB ST238 65ms kit $399
30MB ST4038 40ms kit $599
40MB ST251 40ms kit $599
80MB ST4096 28ms kit $999
All kits include cables and complete instructions for the proper installation in your computer
Free installation in our computer.

VIDEO MONITORS

HiRes monochrome green or amber 1000×350 .....$80*
RGB color 640×200 .....$259*
EGA HiRes 720×350 .....$419*
MultiSync 15kHz to 34kHz 926×580 resolution $559*

Tilt/swivel base .....FREE*
Video extender cable 6' $9
*With purchase of our computer.

VIDEO CARDS

Hercules compatible monographics w/printer $109*
EGA color graphics includes CGA/Herc. modes $179*

KEYBOARDS

5339 AT style 102 key $49*
Extender cable 6' $9
*With purchase of our computer

OUR GUARANTEE

Simply, if anything is wrong with your Clone or any of its peripherals, we'll fix it free for up to one year after you've received your Clone. You have probably read other manufacturers' warranties, and gotten confused, suspicious or even mad. You're probably skeptical about anything as simple and straightforward as our warranty. So here's the fine print.

You can void your warranty by failing to exercise normal care when hooking up or operating your Clone. Or trashing the guts with a hammer. Or running it over with something. Or burning it up.

You have thirty days after receipt of your Clone to see if you and it are going to be compatible. If you are not satisfied with your Clone for any reason within that time you may return it to us for a full refund, less shipping charges. Just don't write in the manuals or lose anything that was in the original container as it all has to be intact.

The other guys only give a 90 day guarantee. Ever wonder why? Ever try to get a refund? Complete warranty details are available on request.

Clone Computers; 2544 W. Commerce St; Dallas, Texas 75212; 214-637-5400; Telex 882761; FAX 214-634-8303;
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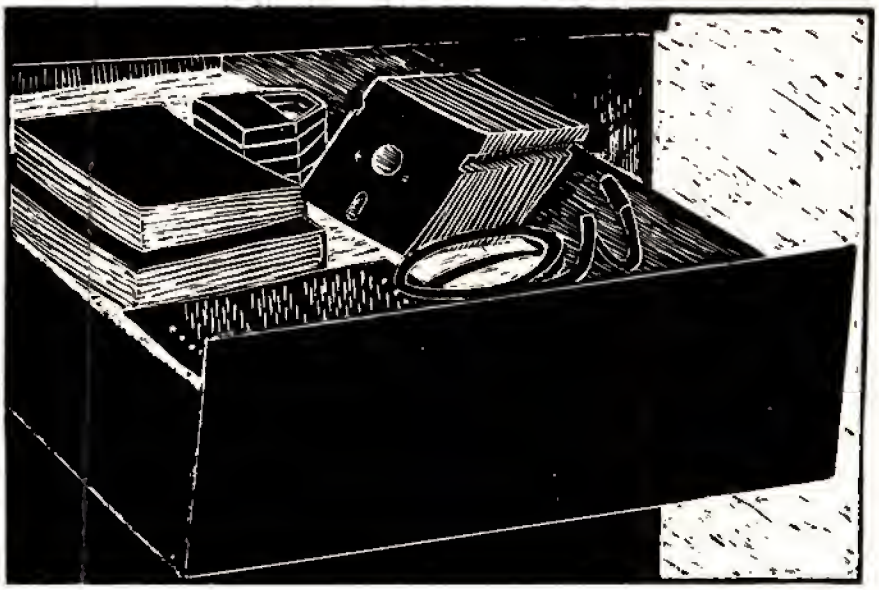
1-800-527-0347 1-800-527-3582

LS-DOS, MRAS, Odds, and Ends



It's been a long time since I have covered a variety of topics in a single column. The middle of summer seems a good time to catch up on some things that won't make an entire column by themselves.

LS-DOS Security

The security scheme used in LS-DOS 6.3 has caused a lot of confusion. The following information comes from several phone conversations with Bill Schroeder, president of Logical Systems Inc. (LSI). This information is included here with his permission and might help clarify some issues.

Like many other software companies, and many of us software users, LSI was concerned about possible piracy when it decided to produce LS-DOS 6.3. It couldn't look to copy protection as an answer, of course, since the idea of a copy-protected operating system is almost ludicrous, especially one that uses overlays as extensively as TRS-80 operating systems do.

LSI took an unusual approach to protecting its development investment in LS-DOS 6.3. The DOS uses a unique "install protection" system. When you first install LS-DOS 6.3, it takes a "snapshot" of your computer. The actual contents of that snapshot are a proprietary secret, but LS-DOS 6.3 is capable of distinguishing between one computer and another. The DOS saves that snapshot on your system disk and on all system backups you make. After the first snapshot, your copy of LS-DOS is personalized for your computer.

From that point on, whenever you use LS-DOS 6.3, it compares your computer to that snapshot. If the comparison fails (if you have moved the DOS to a different computer), the DOS sets a flag. When the flag is set is another proprietary secret, but it is a quick process and only happens

System Requirements

Model 4/4P/4D
128K RAM
LS-DOS 6.3
Editor/assembler, MRAS
Available on The Disk Series

Program Listing. Demonstration of the process of creating a modular assembly program using MRAS, MLIB, and MLink.

```
   This file shows the complete process of creating a modular
assembly-language program using MRAS, MLIB, and MLINK except
for the commands given to the text editor.  Since it is a
demonstration, it is probably more modularized than a "real"
program would be.  This program also demonstrates how to
find the serial number of the user's copy of LS-DOS 6.3
   Program flow:
        1. Check if DOS version 6.3 or later.
              Abort if not.
        2. Open SYS0/SYS for reading.
              Abort if not found.
        3. Read relative sector 10 hex of SYS0/SYS into a buffer.
        4. Close the file.
        5. Locate the ASCII text "Serial# " in the buffer.
              Abort if not found.
        6. Move the 10-byte serial number to a data area.
        7. Print the serial number and then return to DOS.
Steps 2, 3, 5, and 6 will be performed in separate modules.
Steps 1, 4, and 7 will be performed by the main program, which
will also handle all error messages.
Communication between modules will be by registers.
First, create the following file and save it as SVCLIST/ASM
;--------------------------------------------------------
;   SVC's and Macro commands for this project
;--------------------------------------------------------
@DSPLY          EQU     0AH
@CLOSE          EQU     3CH
@FSPEC          EQU     4EH
@FLAGS          EQU     65H
@OPEN           EQU     3BH
@POSN           EQU     42H
@READ           EQU     43H
;
SVC     MACRO   #NUM
        LD      A,#NUM
        RST     28H
        ENDM
;
PRINT   MACRO   #ADDR
        PUSH    HL
        PUSH    DE
        LD      HL,#ADDR
        SVC     @DSPLY
```

Listing continued

Illustration by Claudia Tantillo

occasionally as you use different DOS services (including loading and executing programs). And, occasionally, as you return to LS-DOS Ready from a program, the operating system inspects the flag to see if it has been set.

If you have indeed used a copy of your personalized DOS on a different computer, about once in 100 DOS services the computer stops at the LS-DOS Ready prompt, prints a message stating that you are using an illegal installation of the DOS, and forces you to reboot. By stopping only at the LS-DOS prompt, the system ensures that your data is probably safe since whatever program was running should have closed all files.

If you damage the encryption key, the code produced by decrypting is corrupted.

If all of this happened with normal code in a normal SYS (system) file, of course, patches would soon appear on many bulletin boards to override the LSI protection process. But at least some of the code is not stored normally. LSI has taken two steps to keep the code from meddlers: First, it has stored at least some information between sectors on the disk, rather than as a part of any particular file. And second, it has encrypted much of the code for the protection scheme, as well as your ID number.

A danger exists in encrypted code, of course. If you somehow damage the encryption key, then the code produced by decrypting will be corrupted. If you've been programming in assembly language for any amount of time, you should have some feeling for what happens when the Z80 CPU tries to execute something that really isn't a program. The nicest thing that can happen is that the computer comes to a halt.

Obviously, the key itself cannot be encrypted, and just as obviously, the key must be different for every copy of LS-DOS. The key for decrypting the protection code and data on your disk is, at least in part, your serial number. Every time you boot LS-DOS, the screen displays the serial number. If you have experimented with the library command "ID," you've probably noticed that your identification number and serial number appear to be unrelated. Also, if you have searched your disk for your ID number, you have probably also discovered that

Listing continued

```
          POP     DE
          POP     HL
          ENDM
Create the following file and save it as FRDOPEN/ASM
;-----------------------------------------------------
;   FRDOPEN -- Open a file for reading, set the LRL to
;              256, and ignore the original LRL if
;              it is different.
;
;       Entry:  FRDOPEN
;               HL ==> File name (terminated by CR)
;               DE ==> File Control Block (32 bytes)
;               BC ==> Sector buffer (256 bytes)
;       Exit:
;               Success, Z flag set
;               Failure, NZ flag set, error code in A
;       Uses AF, BC, HL
;-----------------------------------------------------
*GET    SVCLIST                         ;Get SVCs and macros
        CSEG                            ;Put this in code segment
        PUBLIC  FRDOPEN                 ;Make entry point public
FRDOPEN:
        PUSH    IY                      ;Save this register
        PUSH    BC                      ;Save sector buffer addr.
        SVC     @PSPEC                  ;Move and parse file name
        LD      A,13H                   ;"Illegal File Name" error
        JR      NZ,FAIL                 ;Go if error
        SVC     @FLAGS                  ;Else IY ==> flag table
        SET     0,(IY+'S'-'A')          ;Set to ignore original LRL
        POP     HL                      ;HL ==> sector buffer
        SVC     @OPEN                   ;Open file for reading
        JR      EXIT                    ;Jump to end
FAIL    POP     BC                      ;Clear stack if failure
EXIT    POP     IY                      ;Recover IY register
        RET                             ;We're done
        END
Assemble the module with the following command:
MRAS FRDOPEN -WE
If there are no assembly errors, start a library:
MLIB                                <--- Load the librarian
A                                   <--- Add a module
R                                   <--- Module is a /REL file
FRDOPEN                             <--- Module name
S                                   <--- Save the library
I                                   <--- Library in IRL format
SERIAL                              <--- Name it SERIAL/IRL
X                                   <--- Exit from librarian
Create the following file and save it as TEST/ASM
;-----------------------------------------------------
;   Test program for FRDOPEN
;-----------------------------------------------------
*GET SVCLIST
        EXT     FRDOPEN                 ;Lets us link with routine
        CSEG                            ;This is program code
BEGIN   LD      HL,FILNAM               ;HL ==> file name for test
        LD      DE,FCB                  ;DE ==> file control buffer
        LD      BC,SECBUF               ;BC ==> sector buffer
        CALL    FRDOPEN                 ;Open the file
        SVC     @CLOSE                  ;Now close it
        LD      HL,0                    ;No error to DOS
        RET                             ;End the program
;
        DSEG                            ;This is all data
FCB     DS      32                      ;Space for FCB
SECBUF  DS      256                     ;Space for buffer
FILNAM  DB      'TEST/ASM',13
        END     BEGIN
Assemble it with the command:
MRAS TEST -WE
Link the two with the linker:
MLINK                                   <--- Load the linker
TEST                                    <--- Read the main file
-S=SERIAL                               <--- Search SERIAL/IRL for modules
-N=:0                                   <--- Finished file to drive 0
-E                                      <--- Save /CMD file and exit
Now use Debug to trace through TEST/CMD.  You should experiment by
changing the file name.  Watch the Z flag and A register to be sure
errors are correctly trapped and reported.
Create the following file and save it as SECREAD/ASM:
;-----------------------------------------------------
;  SECREAD -- Read a sector from a file into a memory
;       buffer.  Assume that the file is opened with
;       LRL = 256, and that the buffer was designated
;       when the file was opened.
;
;       Entry: SECREAD
;               BC = relative sector number
;               DE ==> FCB of opened file
;       Exit:
;               Success, Z flag set, data is in buffer
;               Failure, NZ flag set, error in A
;       AF is used
;-----------------------------------------------------
*GET SVCLIST
        CSEG                            ;This is program code
        PUBLIC  SECREAD                 ;Define entry point
SECREAD:
        SVC     @POSN                   ;Position file to sector
        JR      NZ,FAIL                 ;Go if error
```

Listing continued

Listing continued

```
        SVC     @READ                   ;Read sector to buffer
FAIL    RET                             ;Return to caller
        END
Assemble this with the command
MRAS SECREAD -WE
Add it to the library:
MLIB                                    <--- Load the librarian
L                                       <--- Load a library
I                                       <--- in IRL format
SERIAL                                  <--- named SERIAL/IRL
A                                       <--- Add a module
R                                       <--- in REL format
SECREAD                                 <--- named SECREAD/REL
S                                       <--- Save the new library
I                                       <--- in IRL formal
SERIAL                                  <--- named SERIAL/IRL
X                                       <--- Exit from librarian
Load TEST/ASM and add the three lines marked with "*****":
;-------------------------------------------------
;   Test program for FRDOPEN and SECREAD
;-------------------------------------------------
*GET SVCLIST
        EXT     FRDOPEN,SECREAD         ; **** Lets us link with routine
        CSEG                            ;This is program code
BEGIN   LD      HL,FILNAM               ;HL ==> file name for test
        LD      DE,FCB                  ;DE ==> file control buffer
        LD      BC,SECBUF               ;BC ==> sector buffer
        CALL    FRDOPEN                 ;Open the file
        LD      BC,0                    ; **** Set to first sector
        CALL    SECREAD                 ; **** Read the sector
        SVC     @CLOSE                  ;Now close it
        LD      HL,0                    ;No error to DOS
        RET                             ;End the program
;
        DSEG                            ;This is all data
FCB     DS      32                      ;Space for FCB
SECBUF  DS      256                     ;Space for buffer
FILNAM  DB      'TEST/ASM',13
        END     BEGIN
Assemble and link this program exactly as before and use Debug
to test it.
Create the following program and save it as MEMSRCH/ASM:
;-------------------------------------------------
;       MEMSRCH -- Search a block of memory for
;       a specific byte string.
;
;       Entry: MEMSRCH
;              HL ==> Buffer to search
;              DE ==> String to search for
;              BC = length of search buffer
;               A = length of string
;
;       Exit: Success -- Z flag set,
;                        HL ==> beginning of match
;                               in buffer
;             Failure -- NZ flag
;       Uses: AF, BC, DE, HL
;-------------------------------------------------
        CSEG
        PUBLIC  MEMSRCH
MEMSRCH:
        DEC     A                       ;Reduce match count by 1
        LD      (STRLEN),A              ;Save string length for later
LOOP1   LD      A,(DE)                  ;Get first byte
        CPIR                            ;Look for first character
        RET     NZ                      ;Leave if not found
        DEC     HL                      ;Else back up to match
        PUSH    BC                      ;Save registers in case
        PUSH    DE                      ;  we have to look
        PUSH    HL                      ;  some more.
        LD      A,(STRLEN)              ;Get string length
        LD      B,A                     ;  into B for loop counter
LOOP2   INC     HL                      ;Point to next in buffer
        INC     DE                      ;And next in string
        LD      A,(DE)                  ;Get next in string
        CP      (HL)                    ;Same as next in buffer?
        JR      NZ,ENDLP                ;(HL) <> (DE) -- go
        DJNZ    LOOP2                   ;Else try the next match
ENDLP   POP     HL                      ;Recover registers
        POP     DE
        POP     BC
        RET     Z                       ;Leave if match successful
        INC     HL                      ;Else move past false match
        JR      LOOP1                   ;  and look some more
;
        DSEG
STRLEN  DB      $-$                     ;One byte of storage
        END
Assemble it with the command
MRAS MEMSRCH -WE
And add it to the library with the commands:
MLIB                                    <--- Load the librarian
L                                       <--- Load a library
I                                       <--- in IRL format
SERIAL                                  <--- named SERIAL/IRL
A                                       <--- Add a module
R                                       <--- in REL format
MEMSRCH                                 <--- named SECREAD/REL
S                                       <--- Save the new library
```

Listing continued

it is nowhere to be found. The ID number is part of the information that is encrypted and hidden.

What happens if you legitimately decide to change your computer, from a Model 4 to a 4P, for example? Simply call the people at LSI, give them your ID and serial numbers for them to look up in their data base, and they'll give you instructions for reinitializing your DOS on a new computer. LSI says it has no interest in hampering legitimate purchasers of LS-DOS, only those who have not purchased their own copies.

For this piece of magic to work correctly, you need to understand logical segments.

Are there ways to defeat this protection system? Probably, but beware of some possible pitfalls. I have heard rumors that programs on local BBSes claiming to sidestep the LSI protection system are nothing more than worms or Trojan horses that will, either slowly or quickly, destroy your disks and data. I have also heard that some protection-defeat programs can work for one or two users but cause constant lockups for others. But since you can make as many copies of your DOS disks as you want, why would you want to defeat the protection system in the first place?

This protection system has a side effect that some software writers might want to consider. A legitimate LS-DOS 6.3 disk has a unique serial number, stored in relative sector 10 hexadecimal (hex) of SYS0/SYS. If you alter that serial number, you are likely to cause a number of system catastrophes.

An application program can easily "piggyback" on top of the LSI protection system. The first time you install the software, it could read the serial number and store it inside of the program. Then, every time the program runs, it can compare this internal copy of the serial number against the one available on the system. If the numbers are different, the program has been moved to a new computer. Of course, such a program would probably want to do its own encryption to discourage someone from using a disk editor to simply change the number.

If, as a software author or publisher, you find a pirated copy of your program floating around, you need only decrypt the serial number, call LSI, and find out

who originally installed the program, since their name will be in LSI's data base. LSI has promised to furnish this information to any software developer who needs it for such purposes. Without resorting to copy-protected disks, your program will have a fair amount of protection from unscrupulous users.

Getting the Most Out of MRAS

Judging from my mail, a number of people who have purchased the MRAS assembler from Misosys are having trouble understanding its advanced features, especially how to write modular programs with it.

The MRAS assembler, along with the MLink linker, MLIB librarian, and SAID editor, is far and away the most powerful assembler available for the Model 4. But to use this package effectively as a development tool, you need to learn a new way of working with an assembler. Much of the following also applies to the advanced features of Radio Shack's Assembly Language Development System (ALDS), although it uses different terminology.

You can use MRAS as a normal assembler. Just use the -GC (generate code) switch when you assemble a program, and MRAS works just like EDAS/Pro-Create. But if you do that, you give up a lot of MRAS's power and make program development more difficult than it should be.

Every programmer knows that it is much easier to write and debug a short program than a long one. With MRAS, you can create complex programs by gluing together short, simple routines. It also encourages you to create routines that you can use over and over in a variety of programs.

You can do this with any assembler, of course, by keeping source-code modules around, hooking them together, and reassembling. But as programs get longer, the chance of a conflict of variable names, as well as the time required for assembly, begins to bog down an entire project. And for really large projects, you eventually run out of memory space to compile a program.

Programming with MRAS is a process of creating small, specific subroutines, assembling and thoroughly testing each, and, ultimately, linking all the subroutines together along with some coordinating logic. Since each module is preassembled, changes to one do not require reassembling the entire program, only a small module, so you spend much less time waiting for the assembler. Also, you drastically reduce the possibility of conflicts between label names in various modules.

The first new concept is the difference between local and global labels. Unless you specify otherwise, every label within a module is local, which means it can only be "seen" by that module. You could write a program with 100 modules, each using a label called Loop, for example. Since each label can only be seen by its own module, there is no confusion about which Loop is meant in each routine.

Of course, routines need to call each other by name, so some labels must be visible outside of a module. Such names are "global" or "public," which means every routine can see and use them. Often, a module has a single global label for its entry point and its other labels are all local. The module performs one specific task and then often returns some information to whatever program called it.

The assembler has to know which labels it should keep local and which to make global. If you want a label to be local, you need do nothing. That is the default. If you want a label to be global in scope, you need to declare it as global when you write the module. You do so with the pseudo-op Global (or Entry or Public—they mean the same thing to MRAS).

In each module, you must also tell the assembler which labels it will find in other modules, that is, those external to the current module. You do that by using the pseudo-op EXTRN or EXT. Therefore, a label you declare Global in one module is EXTRN in every other module that makes references to it.

If you do some planning, you should be able to write most of your subroutine modules so that they are usable in different programs. Think of them as being somewhat similar to TRSDOS/LS-DOS supervisory calls (SVCs) as you write them, and make each perform a specific service that other programs can use.

If these modules are all preassembled, how do you know what address to use as the ORG (origin) of each? You don't, and you don't need to. That's the other new concept necessary for working with preassembled modules. You don't specify any address in any module. Instead, you let a linker program, MLink, put the modules together to create your program and assign absolute addresses to each routine. The assembler creates files with the extension REL, meaning that you can relocate the module to any place in memory. The linker takes all of the

Listing continued

```
I                                       <--- in IRL formal
SERIAL                                  <--- named SERIAL/IRL
X                                       <--- Exit from librarian
CREATE THE FOLLOWING PROGRAM AND SAVE IT AS TEST/ASM:
;-------------------------------------------------------
;  Test program for MEMSRCH
;-------------------------------------------------------
        EXT     MEMSRCH                 ;Tell the linker to find it
        CSEG                            ;This is the code
BEGIN   LD      HL,BUF                  ;HL ==> buffer
        LD      DE,STRING               ;DE ==> string
        LD      BC,BUFLEN               ;BC = buffer length
        LD      A,STRLEN                ; A = string length
        CALL    MEMSRCH                 ;Find the string
        LD      HL,0                    ;No error
        RET                             ;Return to DOS
;
        DSEG
BUF     DC      20,' '                  ;20 spaces
        DB      'This'                  ;A partial match
        DC      20,' '                  ;20 more spaces
        DB      'This is it'            ;The real match
        DB      20,' '                  ;Some more spaces
BUFLEN  EQU     $-BUF                   ;Length of buffer
STRING  DB      'This is it'            ;String to match
STRLEN  EQU     $-STRING                ;Length of string
        END     BEGIN                   ;End of program
;
Assemble and link it with exactly the same instructions as the
first TEST program, and test it using Debug.
Finally, write the following program and save it as SERREAD/ASM
;-------------------------------------------------------
;  SERIAL -- Finds LS-DOS 6.3 serial number and
;    prints it on the screen.
;
;  For use with LS-DOS 6.3 only.
;-------------------------------------------------------
*GET SVCLIST
        EXT     FRDOPEN,SECREAD,MEMSRCH ;Define entries to other mods
        CSEG
BEGIN   SVC     @FLAGS                  ;IY ==> flag table
        LD      A,(IY+27)               ;Get version number
        CP      63H                     ;Right version?
        JR      C,BADVER                ;No -- go
        LD      HL,SYS0$                ;HL ==> file name
        LD      DE,FCB                  ;DE ==> file control block
        LD      BC,SECBUF               ;BC ==> sector buffer
        CALL    FRDOPEN                 ;Open the file
        JR      NZ,O_ERR                ;Error? -- Go
        LD      BC,10H                  ;Read sector 10H
        CALL    SECREAD                 ;Get it
        SVC     @CLOSE                  ;Now close the file
        LD      HL,SECBUF               ;HL ==> buffer
```

Listing continued

Listing continued

```
          LD      DE,SERIAL$              ;DE ==> serial string
          LD      BC,100H                 ;Length of sector buffer
          LD      A,SERLEN                ;Length of search string
          CALL    MEMSRCH                 ;Find serial string
          JR      NZ,NOSER                ;Error -- go
          LD      A,8                     ;Offset to serial number
          ADD     A,L                     ;Add the offset
          LD      L,A                     ;And save it
          JR      NC,$+3                  ;Go if no carry
          INC     H                       ;Else increment H
          LD      DE,SSTORE               ;DE ==> storage area
          LD      BC,10                   ;10 bytes to transfer
          LDIR                            ;Move serial number
          PRINT   SSHOW$                  ;Print it
          JR      EXIT                    ;And leave
;----------
;  Error handling
;----------
BADVER    PRINT   BADVER$                 ;Print error message
          JR      EXIT                    ;And leave
NOSER     PRINT   NOSER$                  ;No serial number
          JR      EXIT                    ;Leave
O_ERR     PRINT   O_ERR$                  ;Can't open file
;----------
;  Exit program
;----------
EXIT      LD      HL,0                    ;Report no error
          RET                             ;Return to LS-DOS
;----------
;  Data area & msgs
;----------
          DSEG                            ;Put in data segment
BADVER$ DB        'Must use LS-DOS 6.3 or later',13
NOSER$  DB        'Serial number is missing',13
O_ERR$  DB        'Cannot open SYS0/SYS',13
SSHOW$  DB        'Your serial number is '
SSTORE  DS        10
        DB        13
SYS0$   DB        'SYS0/SYS.LSIDOS',13
FCB     DS        32
SECBUF  DS        256
SERIAL$ DB        'Serial#'
SERLEN  EQU       $-SERIAL$
;
          END     BEGIN
Assemble the program with the command:
MRAS SERREAD -WE
Link the program with the command:
MLINK SERREAD -S=SERIAL -N=:0 -E              <--- Learn to use MLINK from
                                                   the command line to save time
Run SERREAD/CMD under Debug to test it, then run it normally.
```

End

necessary REL files and puts them into a single CMD program, assigning addresses to everything as it goes.

For this piece of magic to work correctly, you need to understand logical segments. MRAS supports four kinds of segments, but only two are normally used to write modular programs. It is generally desirable to separate the code and data sections of a program into two different areas of memory. Doing so makes debugging easier, keeps a program bug from accidentally writing data on top of program code, and gives most programmers a sense of orderliness. But if each module contains both code and data, how do you separate them in the final program?

The answer is to label segments in each module. You should put anything that is data in DSEG (the data segment). Anything that is program code should be put in CSEG (the code or program segment). When the linker creates the final program, it groups all the data together in one part of memory and all the code in another part. You can either specify the address for each or let the linker decide where each should go.

The other two segments that MRAS recognizes have specialized uses. You normally use the absolute segment, ASEG, when you know the actual address of something at assembly time (rare in the Model 4, but useful for the data structures in low memory on the Model I or III). The segment called Common is used mostly for Fortran programs. You can also use the Common segment (or segments, since you can name various Commons) for various modules that need scratch space and don't care what happens to that space when they aren't using it.

Program modules, which are usually general-purpose subroutines, tend to be small. And, when you work with modular programs awhile, you will collect a large number of such modules. Keeping track of them on disk could soon become a nightmare; it isn't uncommon, for example, to have 100 preassembled modules available for a large program.

The librarian MLIB has the job of organizing the modules in a way that the linker can understand. Instead of having many separate modules in individual files and remembering which ones you need to link, you can ask MLIB to put modules into libraries of related functions. When it is time to link a program together, you tell the linker which libraries to search. It extracts the necessary modules and copies them into your program. It does not include unneeded modules in the final program.

The linker knows which modules to use from a library by keeping a list of EXTRN labels that have not yet been resolved. As it finds modules in the library that have labels declared Global or Public, it pulls the associated modules into memory, separates the segments, and adds the module to your finished program.

You need to consider one final issue before writing program modules. Modules need to pass information back and forth. There are three common methods for doing so. You can pass information in registers, much as TRSDOS/LS-DOS SVCs do; on the stack, as programs written in C do; or through Public or Common data areas, as, I understand, Fortran often does. The first approach is probably easiest if you are writing routines that you will use only in assembly programs. If you want to write routines to use both in assembly programs and with another language such as C or Fortran, you should follow the guidelines of that language.

This month's demonstration program (see the Program Listing) shows how the whole process works. This short program extracts the serial number from an LS-DOS 6.3 disk and displays it on the screen. I've included all the steps necessary to produce a modular program, including the commands given to MLIB and MLink to create the final program. If you want to run the program using another assembler, combine the modules into one source file, remove the segment, Public, and EXTRN pseudo-ops, and change the label names where necessary.

Instead of separate listings, I have included all listings with instructions in a single text file (Listing 1), along with explanations. I've assumed that you will use both the librarian and linker in interactive mode, which is best for learning, although once you are familiar with them it is easier to write JCL files that use each in command mode. Even though this is a short program with only a few modules, the listing should give you a good feeling for how to use the MRAS tools to create much larger programs.

Odds and Ends

Many of you write to me with the same questions, so I will answer some of them here.

First, as far as I know there is no tutorial book on Model 4 assembly programming. If you are just starting, you

should buy a general-purpose Z80 tutorial book (they range from simple to complex). You should also buy the *Model 4 Technical Reference Manual* from Radio Shack and Roy Soltoff's *Programmer's Guide to LDOS/TRSDOS 6* from Diskcount Data (2701-C West 15th, Suite 612, Plano, TX 75075). Most Z80 books explain how to write in assembly and also talk about using CP/M. Ignore the CP/M stuff and find the parallel information in the *Technical Reference Manual* or the *Programmer's Guide*. You can also find Model 4 assembly tutorials in past issues of this magazine.

Second, some of your requests for programs end up in this column. But otherwise I don't have time to write programs for free.

Third, I strongly advise against specialized patches to TRSDOS/LS-DOS 6 and much prefer writing short filters or modifying the DOS with the System commands and then saving the results with Sysgen. But if you do want to know the absolute addresses for patches, I suggest you purchase a copy of *The Source* (available from Misosys, P.O. Box 239, Sterling, VA 22170-0239, 703-450-0239). Since *The Source* was written for TRSDOS 6.2, not all of it will be applicable to LS-DOS 6.3, but it should at least show you where to look and what to look for.

Finally, a list of my favorite programming tools for the Model 4: I use MRAS and Pro-Create about equally as assemblers, depending on the project. I use Misosys's Pro-DD&T extension to Debug for most debugging work, as well as the Pro-Duce disassembler. I use the C language (the Misosys Pro-MC compiler) whenever possible instead of assembly for anything longer than short utilities.

I only use Basic for "quick and dirty" short programs, rarely for anything that takes more than 30 minutes to code and debug. And I use SAID (included with Pro-Create and MRAS) as my text editor for almost everything. ■

Write Hardin Brothers at 280 N. Campus Ave., Upland, CA 91786. Enclose a stamped, self-addressed envelope for a reply. You can also contact Hardin on Compuserve's WESIG (PCS-117).

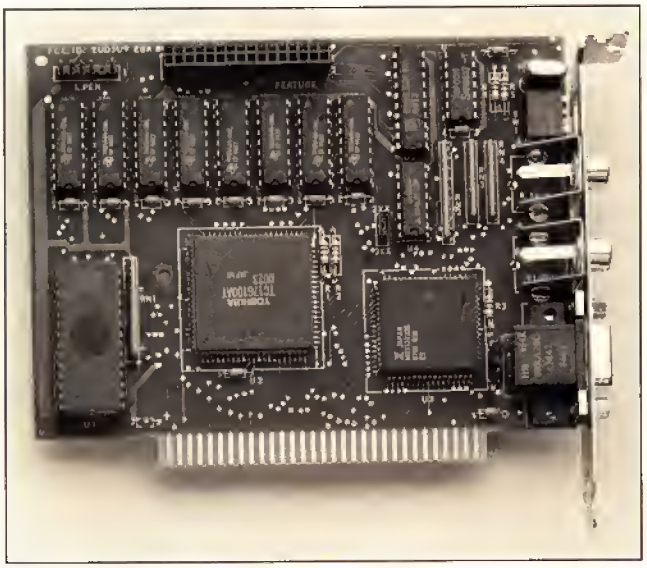
MS-DOS

Boca's EGA

The EGA by Boca contains fewer components than other enhanced graphics adapters, resulting in better heat dispersion and reliability, but it provides all the standard EGA features, including 256K of video RAM. To install the card, set its switches to indicate the type of monitor you have and the other display adapters you have installed, and place the board in your computer.

EGA by Boca's software includes a screen-saving function, mode-change capabilities, and diagnostic routines. The card is backward-compatible with the Hercules card, the CGA, and MDA. Color resolution is 640 by 350; monochrome is 720 by 348. Its character generator can hold up to 512 displayable codes. The package costs $199. Contact Boca Research Inc., 6401 Congress Ave., Boca Raton, FL 33431, 305-997-6227.

Circle 552 on Reader Service card.



EGA by Boca fits the Tandy 1000 SX, 1200, and 3000.

Mouse Emulation

Your digitizer tablet can emulate the Microsoft mouse using Microsync's mouse emulation driver. The driver is resident and needs to be loaded only once.

With this software you can adjust the digitizer's scale, tailoring your device to a specific application. The mouse emulation driver costs $49.95. Contact Microsync Engineering Inc., 1512 S. 60th St., Omaha, NE 68106, 402-551-2670.

Circle 557 on Reader Service card.

Special Fonts

Turbofonts lets you incorporate scientific, foreign language, or special business characters into your word-processing documents. You can use the package to control the keyboard, screen, and printer to produce over 30 fonts. You can also customize one of the fonts or create new characters.

One of Turbofonts' features lets you merge high-quality graphics into text during printing. Prices for Turbofonts range from $149 to $175 depending on your printer. Contact Image Processing Systems, 6409 Appalachian Way, P.O. Box 5016, Madison, WI 53705, 608-233-5033.

Circle 558 on Reader Service card.

6809 Macroassembler

The ASM689 macroassembler develops machine code for the 6809 microprocessor and runs on the Tandy 1000. It supports modular program development and generates a LST file that gives the value of the labels, the lines they are used on, and whether they are local, public, or external.

Its full-screen editor stays resident at all times. A complete set of error messages facilitates debugging. You can merge external files into the resident file.

When developing code that resides in ROM, you can reserve storage by label in a RAM area using separate segment counters. As a result, you can develop interleaved source code for two more processors or I/O channels.

You can address registers in hexadecimal or decimal, by name, or by a mix of labels and numbers. You can specify addresses in relative addressing instructions as positive or negative offsets or use an address label.

ASM689 supports all 6809 instructions and addressing modes and uses Motorola mnemonics. It costs $249 from Microcomputer Tools, 912 Hastings Drive, Concord, CA 94518, 415-825-4200.

Circle 571 on Reader Service card.

Layers of Memory

Version 3.0 of the Popdrop memory-management utility lets you load memory-resident programs in layers and remove them without rebooting the system. Popdrop 3.0 also uses fewer bytes for each layer than previous versions. The number of layers increased from 8 to 16.

New commands include View, which lets you display the layers loaded and the memory used. A "hooks" command displays the DOS interrupt vectors hooked by layer to help identify potential conflicts between resident programs and cases where loading sequence could be critical.

The program runs with DOS 2.0 through 3.0 and is not copy-protected. It costs $49.95. Upgrades are $30. Contact Infostructures Inc., P.O. Box 32617, Tucson, AZ 85751, 602-299-5962.

Circle 555 on Reader Service card.

Get Out of Town, Fast!

Streetsmart provides detailed directions to locations within a city. The program can give you the most efficient route for a maximum of 100 destinations.

With the help of a command menu, you can build a customized map of any town, complete with provisions for one-way streets, distances, and block addresses. The program requires 256K; with 640K you can insert 6,000 intersections. It is available on 5¼- or 3½-inch disks for $89 from Street Map Software, 1014 Boston Circle, Schaumburg, IL 69193, 312-529-4044.

Circle 569 on Reader Service card.

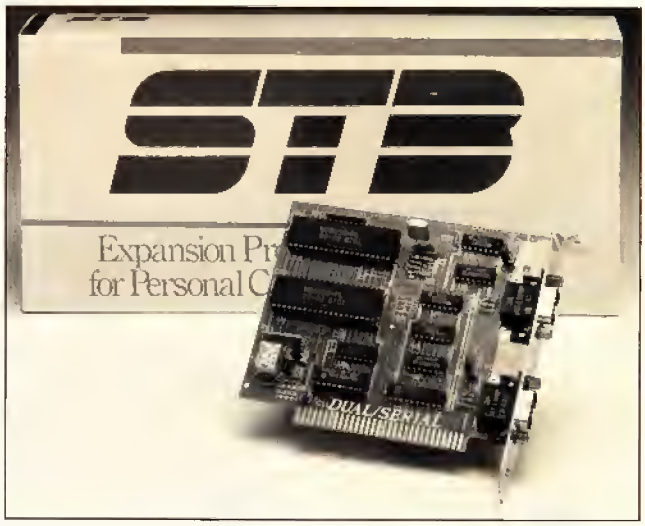
Guide to Compatibility

The *Educational Software PC Compatibility Guide* addresses the incompatibility problem of IBM clones. The guide lists the MS-DOS compatibles that certain products will and will not work on.

Indexed are over 1,000 programs and 31 machines, including Tandy's. The guide also lists the system requirements for each program. It costs $49.95. Contact PC Compatibility Guide, 2413 Grandview Drive West, Tacoma, WA, 206-564-5428.

Circle 570 on Reader Service card.

NEW PRODUCTS



The Dual Serial Adapter by STB Systems increases the functionality of PC compatibles.

Two Ports, One Board

STB Systems recently introduced the Dual Serial Adapter, which combines two asynchronous serial ports on a single short board. The adapter features two independent serial connectors for increasing the functionality of your IBM PC compatibles.

The adapter provides additional RS-232C ports for serial devices. It is available for $149. For more information contact STB Systems Inc. 1651 N. Glenville, Suite 210, Richardson, TX 75081, 214-234-8750.

Circle 564 on Reader Service card

The Return of Floyd

Floyd, the robot you met in the interactive adventure, Planetfall, returns to your computer in Infocom's sequel, Stationfall.

You are enlisted in the Stellar Patrol, but your job is tedious as a first lieutenant on the paperwork task force—that is, until you and Floyd are sent to a deserted space station where you meet an ostrich, an Arcturian balloon creature, and a brainy robot named Plato. Your machinery breaks down, Floyd starts acting strangely, and the adventure begins.

The Stationfall package contains a set of three assignment forms, blueprints of the space station, and a sew-on Stellar Patrol patch. The adventure package is available for $39.95 from Infocom, Inc., 125 Cambridge Park Drive, Cambridge, MA 02140, 617-492-6000.

Circle 567 on Reader Service card.

Eliminate File Fragmentation

Designed to restore fast, hard-drive data access, DS Optimize reorganizes your drive to improve computer performance. It eliminates the file and directory fragmentation DOS creates through normal computer use.

With this menu-driven program, optimizing a 10-megabyte disk takes eight minutes or less. You can back up, verify, and run CHKDSK without exiting the program. DS optimize allows you to organize your files according to those read and written to most often.

DS Optimize is available for $69.95 from Design Software, 1275 Roosevelt Road, West Chicago, IL 60185, 800-231-3088.

Circle 560 on Reader Service card.

Kindergarten to B.A.

Compu-tations' quiz-authoring system features a standard format to create tests for any grade or subject. This courseware has a single menu that lets you access, edit, or create exams that have review and reinforcement capabilities. Subjects

can cover languages and topics with scientific notation, mathematical notation, and graphics.

The quiz-authoring system costs under $30. For a free catalog of educational software, contact Compu-tations Inc., P.O. Box 502, Troy, MI 48099, 800-345-2964.

Circle 550 on Reader Service card.

STB's Graphics Adapter

A multiple high-resolution Enhanced Graphics Adapter (EGA) supports IBM's VGA and provides compatibility with the EGA, CGA, MDA, and Hercules, the video standards. Multi-Res II produces 16-color enhanced graphics and high resolution for display of operating environments, business graphics, communications, and CAD and desktop-publishing applications.

The Multi Res II drives a wide range of monitors. It maintains VGA compatibility through hardware support at the BIOS level; it doesn't require any preboot software or unique drivers. The ROM BIOS chip will be available to current EGA Multi Res owners who want to upgrade to VGA compatibility. Multi Res II sells for $449 from STB Systems Inc., 1651 N. Glenville, Suite 210, Richardson, TX 75081, 214-234-8750.

Circle 566 on Reader Service card.

PC Phone Mailbox

PC-Telepost Electronic Mailbox can run in background mode in a multitasking system to automatically send and receive your electronic mail.

This e-mail program delivers both text and binary files, such as documents, spreadsheets, graphics, and computer programs.

The remote computer must use the standard x-modem CRC file-transfer protocol, but it doesn't need to use the PC-Telepost software.

PC-Telepost runs on MS-DOS 2.x. It is available for $75 from Coker Electronics, 1430 Lexington Ave., San Mateo, CA 94402, 415-573-5515.

Circle 559 on Reader Service card.

Schedule Appointments with SAM

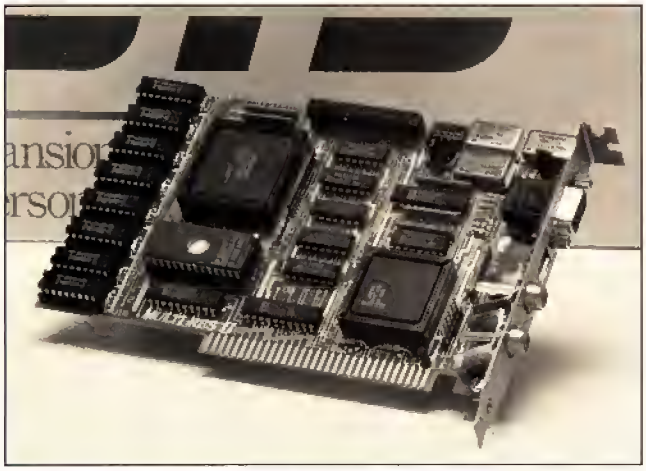
Schedule and Appointment Maker software is designed for medical, dental, hearing, and other professionals to schedule, cancel, and change office appointments. SAM keeps track of doctor/clinician availability and appointments for individual and group sessions. It can handle up to 2,000 patients and 200 doctors and compiles statistics on scheduling information.

It is available for $295 from Digital Hearing Systems Corp., 2934 Shady Lane, Ann Arbor, MI 48104, 313-973-2658.

Circle 563 on Reader Service card.

Custom Accounting

Based on modules, Custom Accounting lets you custom-



Multi Res II produces 16-color enhanced graphics.

ize your accounting procedures for your business. It features tracking options (developed by people who run their own businesses) that you can tailor to your needs.

The modules, which are fully integrated, include Payroll, Accounts Payable, Accounts Receivable, and Inventory/Job Costing. A demonstration program is available for $50 (refundable). For complete information, contact D.W. & Associates, P.O. Box 623, Naperville, IL 60566, 312-983-5866.

Circle 554 on Reader Service card.

Let Genie Do It

A utility to solve data- and file-conversion problems between computers, File Genie lets you implement format changes, process source-code conversion, convert mainframe data, and detect unseen errors in data files. The only criterion of compatibility is that each system run MS-DOS.

File Genie includes a search-and-replace utility for ASCII code that can use logicals and wild cards. Another feature analyzes data-base file structures. You can write your own utilities to manipulate any type of file. File Genie is priced at $69.95. For more information, contact Team Austin Inc., 6809 Convoy Court, San Diego, CA 92111, 619-278-5353.

Circle 551 on Reader Service card.

Coach MS-DOS

Maximizer:Personal Running Coach, from Mii-Fitness Software, is a program that sets goals, assigns workouts, and provides progress reports for joggers and professional runners alike.

Each workout is based on the previous day's activity, your current physiological data, and your training history. It recommends modified goals when poor weather or injury impedes your progress.

The program consists of three disks: Base Training, Maintenance/Peak Prep, and Peaking. It costs $79.95 and requires 128K and two disk drives. It is available for MS-DOS 1.0 and higher from Mii-Fitness Software, RD #1, Box 241, Madison, NY 13402-9736, 315-824-1256.

Circle 561 on Reader Service card.

Quickreport Meets Clipper

Quickreport has been revised to support the Clipper compiler. It can now access the non-compatible Clipper NTX indexes as well as normal Dbase NDX index files.

Quickreport is a report writer that defines a variety of tabular and free-form reports using information stored in data files. The reports can be printed from within applications programmed in Clipper, Dbase II, Dbase III, or directly from DOS.

Quickreport's price remains at $295. Current owners desiring Clipper compatibility can upgrade for $29. Contact Fox & Geller Inc. 604 Market St., Elmwood Park, NJ 07407, 201-794-8883.

Circle 553 on Reader Service card.

XT-286 Speed Card

The half-slot add-in XT-286 Speed Card uses an 80286 processor fed by high-speed cache memory at 10MHz with zero wait states. For better compatibility, the 8K of cache memory, not an increased clock speed, performs the acceleration.

Outside switches disable the cache memory and/or the 80286. The XT-286 Speed Card is available for $499 from SMT Inc., 1145 Linda Vista Drive, San Marcos, CA, 92069-3820, 800-648-6262 or 619-744-3590.

Circle 568 on Reader Service card.

Get the Picture, Too

Television, communications software designed to send pictures, uses advanced

data compression to reduce the size of a graphics image and special encoding to send them through any electronic-mail system. You can send a single message containing text, graphics images, and binary data.

Television sends a medium-resolution (320 by 400) color image in 45 seconds at 1,200 baud. It is a mouse-driven, icon-activated program and includes a driver for the Polaroid Palette so you can make slides from your images. The program requires 256K and MS-DOS 2.0 or higher. Television lists at $99. For more information contact LCS/Telegraphics, 261 Vassar St., Cambridge, MA 02139, 800-437-0036 or 617-547-4738 in Massachusetts.

Circle 562 on Reader Service card.

Double Hard-Disk Storage

Me2, a software utility that uses redundant on-line hard-disk storage to provide fault-tolerant disk operation for PC/AT-type computers, permits parallel storage of critical data. The utility automatically backs up two identical copies of data on two separate disks within the same machine.

It can support four 32-megabyte partitions per drive, and its password system has up to nine levels of user-programmed access. All of its features are independently enabled or disabled, and its security features require no intervention once installed. Me2 is available for $285 from Atlantic Microsystems Inc., 8A Industrial Way, Salem, NH 03079, 603-898-2221.

Circle 565 on Reader Service card.

Data-Handler Plus, Come Forth

MMSForth is a version of Forth that provides a full-screen editor, an on-line assembler, and the ability to use disks interchangeably between MS-DOS machines and the TRS-80 Models I, III, and 4, among other features.

A variety of applications and utilities support MMSForth. DataHandler-Plus, a data base that occupies 64K of RAM and uses another 64K–576K for file buffering, lets you select records conditionally on any fields or fragments with delay time less than a half-second. You can also sort on any multiple fields in several records.

Because the Forthwrite word processor uses subfiles and runs in MMSForth, it can use TRS-80 data disks in an IBM PC. One special feature is its Insert mode, which works directly in text, letter by letter, while you type and the display continues to word-wrap without hesitation.

A license for MMSForth is $180. Both Data-Handler-Plus and Forthwrite are $99.95. For more information, contact Miller Microcomputing Services, 61 Lake Shore Road, Natick, MA 01760, 617-653-6136.

Circle 573 on Reader Service card.

TRSDOS

Adjusting LeScript

Two sets of modifications for LeScript let you adjust this word processor for your needs. Set 1 lets you change the shape and speed of the cursor, adjusts certain keyboard functions, alters screen and text formatting, such as screen width, and provides a patch for the /KSM file. Set 2 gives you a functional Dvorak keyboard on your Model III or 4.

You can make your changes permanent by running a short program. One set costs $15.95; for both, $25.95. The modifications work for LeScript 1.67, 1.68, and 1.70. For more information contact Program Customizing, 245 Richelieu, McMasterville, Quebec J3G 1T7.

Circle 572 on Reader Service card.

Etc.

Inmac offers two products for peripheral sharing. One also screens out data-scrambling noise.

Peripheral Command

Inmac has released two products for peripheral sharing. The PC T-Switch gives you the ability to command two peripherals from your PC, or it can let up to four people share one laser printer, plotter, or modem.

Since PC T-Switch is constructed in an unshielded case, it can only be used in conditions in which it is far enough away from other machines that can cause interference (such as generators, soft-drink machines, and copiers). It is adequate if you are switching in a small, localized area such as an office. The 25-pin, two-device version is priced at $99.

The Clear Signal Plus T-Switch ($119 for the 25-pin, two-device version) allows peripheral sharing and screens out any data-scrambling noise to ensure your signal emissions are within FCC regulations. It comes in two models. One has a key so you can control unauthorized access to devices or to a sensitive data base. The other lets two users have equal and simultaneous access to two compatible peripherals.

For a catalog or the number of a local Inmac distributor, contact Inmac, 2465 Augustine Drive, Santa Clara, CA 95054, 800-547-5444.

Circle 577 on Reader Service card.

Brother's HR-40 Printer

Brother's HR-40 letter-quality printer includes both a built-in sheet feeder and a built-in forms tractor. It features a triple-bin sheet/envelope feeder, second color printing, the ability to "park" fanfold paper to feed individual sheets, and an optional KB-150 keyboard.

The keyboard turns the printer into an electronic typewriter that allows you to highlight in red portions of address labels, short documents, and envelopes. You can view characters before you print. The HR-40 ($799) and the optional typewriter ($299) are available from Brother International Corp., 8 Corporate Place, Piscataway, NJ 08854, 201-981-0300.

Circle 580 on Reader Service card.

Brother's HR-40 letter-quality printer includes a built-in sheet feeder and forms tractor.

The full-duplex Clear Signal 212A modem can transmit and receive data simultaneously.

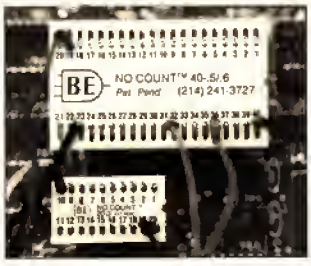
Transmit, Receive Calls Simultaneously

The full-duplex Clear Signal 212A modem can transmit and receive data simultaneously. With the Clear Signal Fast Talk modem you can transfer data at 2,400 baud.

You can use both modems with dial-up and leased lines connected to any RS-232 computer. Both have an auto-answer feature.

The Clear Signal 212A 300/1,200-baud modem costs $289, and the Fast Talk 2,400-baud modem costs $459. Prices include an RI-II cord and a power adapter. Both are available from Inmac at 2465 Augustine Drive, Santa Clara, CA 95054, 800-547-5444.

Circle 582 on Reader Service card.



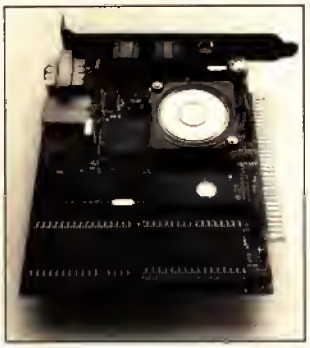
No Count eliminates pin counting.

No Count

Available in 14 configurations, No Count is a numbered pin locator that slips over the pins of an integrated circuit test clip. No Count remains with the clip, so when you attach the test clip to the IC, you can easily identify each pin. This eliminates pin counting and reduces error.

The configurations range from 14 to 64 pins and cost from $3.50 to $6.50. Contact L.J. Boder Enterprises Inc., 11105 Shady Trail, Suite 115, Dallas, TX 75229, 214-241-3727.

Circle 575 on Reader Service card.



Novations' 2400 XE/HC half-card modem features automatic equalization.

Half-Card Modem

Novations' 2400 XE/HC half-card modem is compatible with the Hayes AT command set, as well as with the Bell 103, 212A, and CCITT V.22 standards. The modem can operate in synchronous or asynchronous data formats and handle half- or full-duplex transmission.

Among its features are automatic equalization, auto-dial and auto-answer, and built-in test functions. MS-DOS-compatible Procom software comes with the modem. The 2400XE/HC is available for $229 from Novation Inc., 21345 Lassen St., Chatsworth, CA 91311, 818-998-5060.

Circle 579 on Reader Service card.

New Products listings are based on information supplied in manufacturers' press releases. 80 Micro has not tested or reviewed these products and cannot guarantee any claims.

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RADIO SHACK, TANDY OWNERS find the computer equipment you need that Tandy no longer sells. Pacific Computer Exchange buys and sells used TRSDOS MSDOS computers and peripherals. 503-236-2949. Pacific Computer Exchange, 1031 S.E. Mill Suite B, Portland, OR 97214

TANDY 1000/SX/EX/3000/3000 HL. Discount Software/Hardware. Micro 1000. P.O. Box 1192 Orange, TX. 77631. (409) 886-3808.

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RENT Software $3/disk! Domain/commercial for T-1000-3000. CCS 728 Muskogee, Norfolk VA 23509. (804) 853-3441.

Physicians! Patient Care programs. Exercise perscriptions, PFT, TPN, Others. Medaide, 815 S. Quebec, Tulsa OK 74137.

128K MODEL/4 ASSEMBLERS, disassemblers, editors, other utilities, multibank switching, from $50. Details: write DCL, 11715 Weathervane Dr., Knoxville, TN 37922.

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Tandy 6000 Model 16BHD, DC Modem II, Cables, memory boards, chip sets, DT-100, Xenix, Multiplan, Scripsit, Profile, GL Multiuser software. $4,000. 802-257-0704.

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Profile users! PROAID III+/4+ provides many features for reports from single or multiple files. Model III/4's. $49. Clay Watts Software, 68C North Loop, Cedar Hills, TX 75104. 214-291-1171.

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Brand Loyalty Debate Continues

I've been reading your magazine for two years now. Since using the Model 4, I have been continually impressed with its performance. I realize that newer machines are more powerful and can do more tricks. I attend school and have used IBM PCs, VAX minis, and the newer PC compatibles. I know where the Model 4 fits into the scheme of things. As long as my Model 4 continues to do the job, I'll keep it. TRSDOS 6.2 is a sophisticated operating system and to have access to the source code of such a system is a dream come true.

I read each issue of *80 Micro* word for word. I don't mind coverage for Tandy 1000, but if you don't cover the Model 4, where will Model 4 owners go? Tandy has an excellent 8-bit computer in the Model 4 that nicely complements its line of 16-bit computers. With a lower price and more support, Tandy could retain the share of the market that right now is slipping away. If the Model 4 dies, this is one customer that will switch brands as a matter of principle.

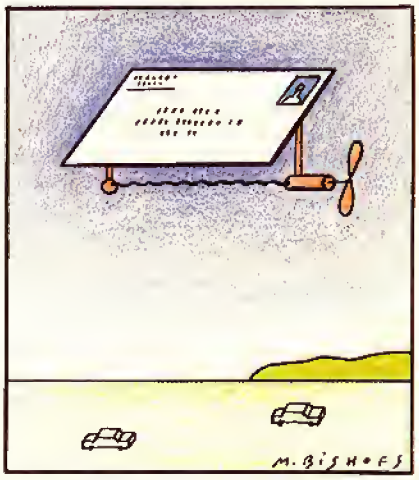
Carl M. Mudryk
Moosejaw, Saskatchewan

Game Therapy

Eric Maloney's May 1987 Side Tracks column really drew me in. I had always argued that people who buy expensive home computers for the sake of playing video games are people who don't know how to manage their money or who have fat wallets.

But I believe that my maturity is moving the opposite direction of Eric's. At 32, when I'm not working behind my computer, I'm playing behind it. As a freelance writer and programming consultant, the pressure gets intense. After hours of haggling with clients, I turn to my trusty Model 4, boot up a Model III game, and as the lo-res invaders swoop down on my little ship, I visualize pasting the human object of my frustration onto the little blocks of phosphorescence. I rack up scores like you wouldn't believe.

I recall reading somewhere that the more a person uses his or her brain, the greater is the need for play. It seems to me that if people are moving away from



games, then computers are no longer challenging people as they once did.

David Goben
Mansfield Center, CT

More Problems with Color

James C. McCord's letter in *80 Micro*'s April 1987 Input (p. 10) contained complaints about Tandy's reaction to his questions regarding a problem running three internal boards on his Tandy 1000. His letter finds a sympathetic ear in Canada. I bought a 1000 HD and right away had no color from the composite video. Ongoing reference to the Tandy store did not solve the problem, which included the backward installation of VR1, covered by Tandy service no. 1000:24 of Dec. 30, 1985.

When I bought the machine it was still the real Tandy-Radio Shack in Canada, not the present Intertan arrangement. Five months after the bulletin Tandy still sold this model in defective condition without telling its store managers about the problem. I found out about it from the January 1987 issue of *80 Micro*. The local store manager went to bat for me once he was aware of the problem. But I still didn't have color. Eleven months later we solved the problem. The solution was in the start-up procedure. This is only one of a series of disappointments. The fault was Tandy's defective merchandise support.

Walter R. Allen
Oakville, Ontario

Tell Your Story

What's the best experience you've had with Tandy or its computers? What's the worst experience? *80 Micro* is looking for interesting anecdotes about our readers and their computers to publish in this Input column.

So don't be shy; send us a letter describing your story. In return, we will send you a genuine "I Break for *80 Micro*" bumper sticker.

Change in Plan

The Mid-Cities TRS-80 Users Group recently changed its meeting schedule. The group now meets on the second and fourth Tuesdays of every month at the Arlington Community Center in Vandergriff Park, 2800 South Center St., Arlington, TX. Membership is free. Call me at 817-535-7931 for more information.

Rob Yoder
Arlington, TX

Thanks for the Memories

I just received your May 1987 issue, my last issue of *80 Micro*. I have been a longtime reader of your magazine and have found the editorial, advertising, and programming content helpful.

I use my Model III to prepare taxes, write letters, prepare mailing labels, and of course, to play games. But the technology has moved on and there are fewer articles in your magazine that I find useful. I understand. Lately, *Popular Mechanics* has not printed many articles on the Model A, either. I wrote to say thanks for eight wonderful years. It was a lot of fun reading your magazine.

Joaquin B. Oviedo
Los Angeles, CA

Software Over There

Computer peripherals are not readily available for American service members stationed overseas. Dealing with American mail-order companies is not always an option because many of them are unwilling to send their wares to Army Post Office (APO) addresses. They do not understand that mailing an item to an APO or Fleet Post Office (FPO) address is not the same as mailing it to an international

Continued on p. 115

Illustration by Maris Bishofs

Continued from p. 116

address. APO and FPO rates are the same as those for mailing to New York City or San Francisco.

The military postal service assumes responsibility for shipping the item to military postal offices in Europe and Asia. No additional cost is incurred by the sender.

There is a large market for computer products overseas, and many mail-order companies would profit from taking advantage of it. Asking us to call for shipping information on APOs and FPOs does us no good since we are charged high international dialing rates, even on toll-free numbers.

Captain Ronald E. Miller
APO New York, NY

Give the People What They Want

As far as I am concerned, I did not abandon Tandy, it abandoned me and its other customers. Tandy's lack of serious support for any of the low-end computers and its antiquated "Don't open the box" policy finally became unbearable. While IBM was combining the good features of the Models I and III and the Apple II, Apple and Tandy were busy trying to foist their visions of the future (the Model 16 and the Lisa) on a marketplace that could not have cared less.

If you don't like IBM, remember that Tandy and Apple gave it their business gift-wrapped. Apple and Tandy tried to sell people what the manufacturers thought they should have and not what the people wanted. Tandy's habit of throwing a tantrum when criticized did nothing to improve the company's image.

Michael W. Joerms
Westmont, IL

Tandy 2000 Orphans

The Tandy 2000 Orphans publishes a monthly newsletter with a data base that supports members with patches and ports for updates of major software, tricks for killing bugs, and a place to ask all questions, no matter how simple or complex.

The group also provides information on used hardware, software, group purchasing of hardware for wholesale discounts, and price listings of Tandy 2000 items. Owners of the 2000 can write for information to David R., 387 Main St., Westport, CT 06880. Membership is $10; you are requested to respond to a survey regarding your needs, knowledge, and system.

David R.
Westport, CT

80 Micro's BBS is open 24 hours a day. It offers programs you can download, special-interest groups, and a classified section. You can reach the board at 603-924-6985; UART settings are 300/1,200 baud, 8-bit words, 1 stop bit, no parity.

Computer Buff Wants Exchange

I am a 19-year-old computer enthusiast who would like contacts in your country. I have a Model I with 64K, two disk drives, and high-resolution color graphics. Please write me at Meissenerstrasse 7, 4352 Herten, West Germany. At this moment I am developing an interface for two video tape recorders to cut tapes with my computer.

Bernd Porr
Herten, West Germany

Send your correspondence to Input, 80 Micro, 80 Elm St., Peterborough, NH 03458. We reserve the right to edit letters.

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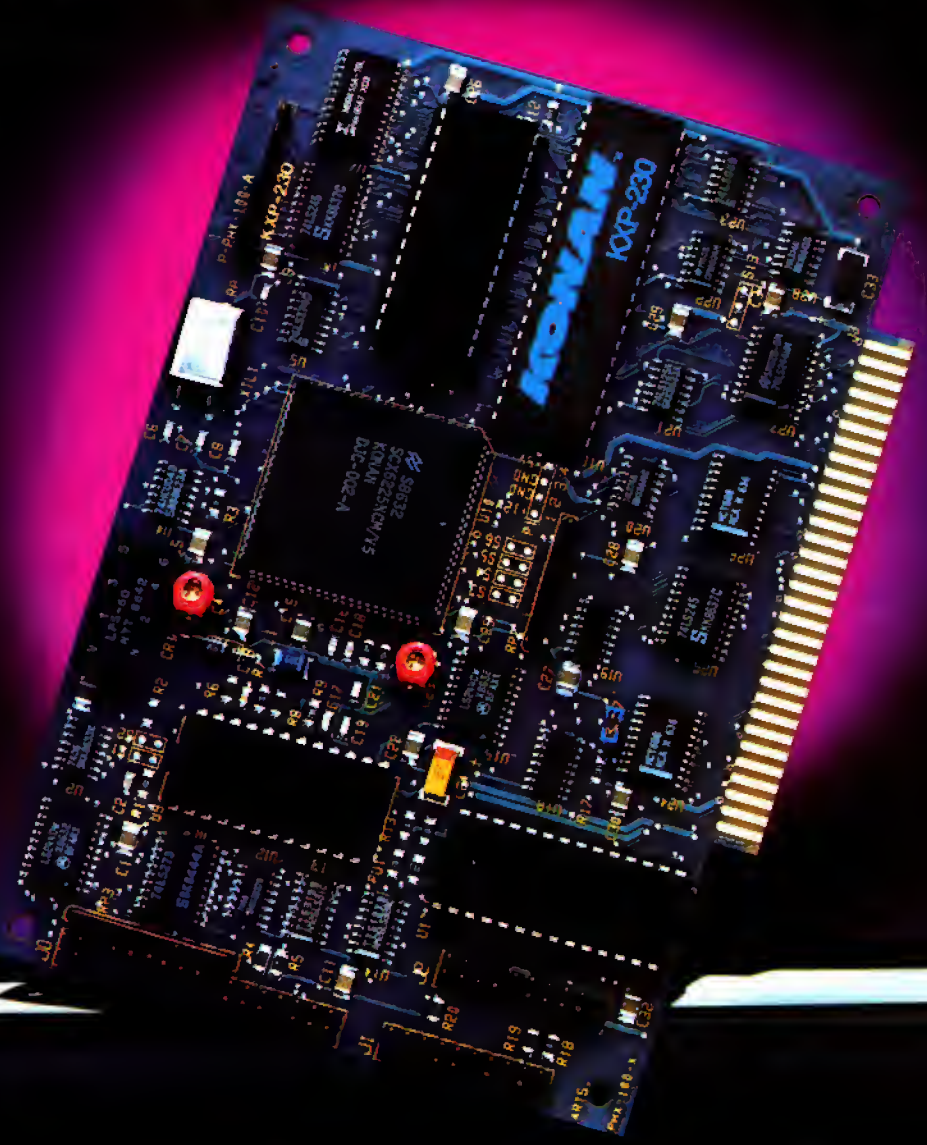

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